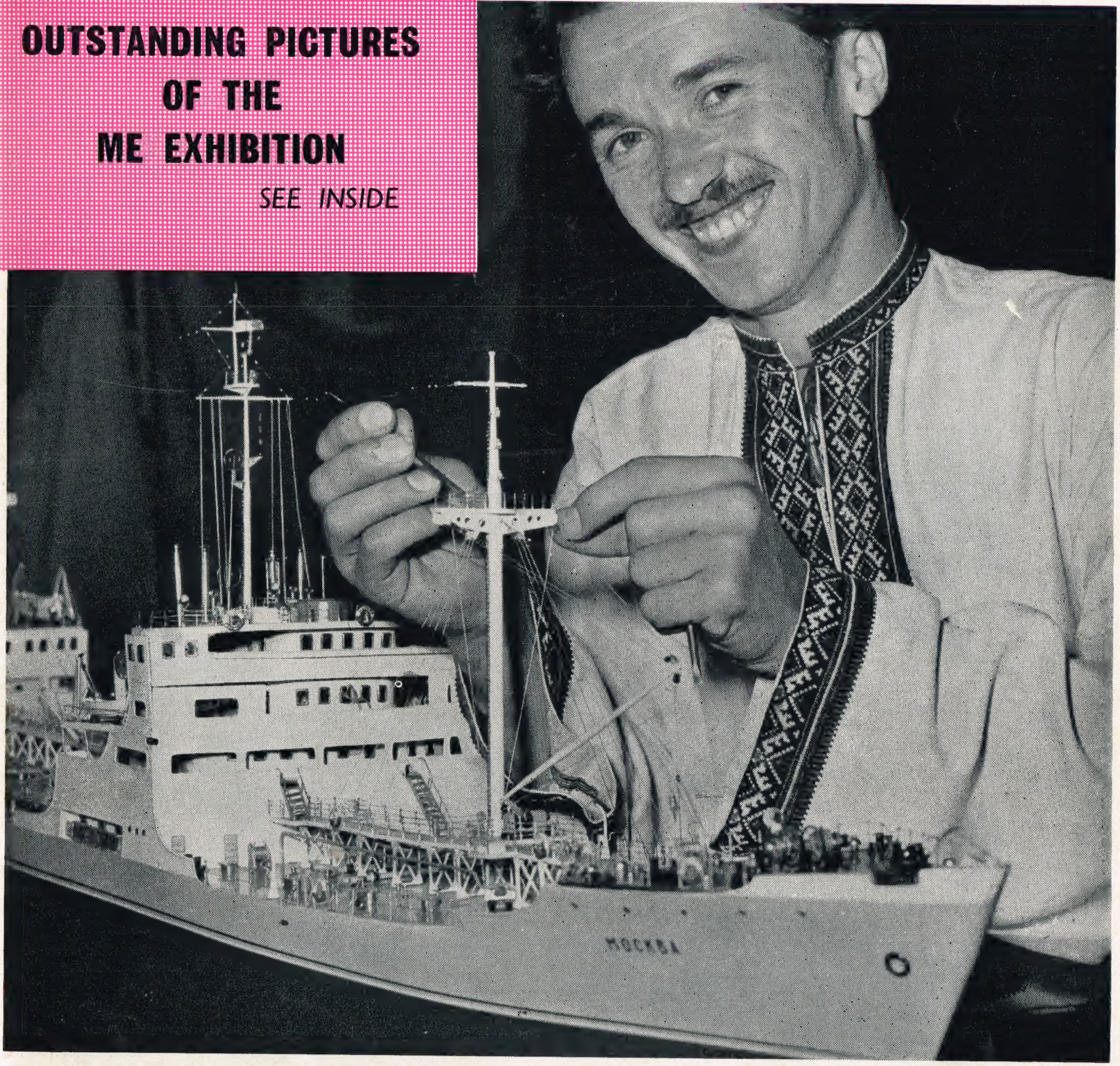
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

OUTSTANDING PICTURES OF THE ME EXHIBITION

SEE INSIDE



ONE SHILLING 12 SEPTEMBER 1957 VOL 117 NO 2938

Model Engineer

ONE SHILLING 12 SEPTEMBER 1957 VOL. 117 NO 2938

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

In this issue

Next week

The Exhibition:
Review of locomotives
Review of ship models
Round the club stands

Bearing assemblies: Some notes and comments on fitting ball and thrust races

Nottingham track: The official opening by the Lord Mayor of the city

MPBA regattas

Steam road carriages: C. E. Page writes about steam road carriages that were running nearly 100 years ago

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

STORY written by my colleague, Joseph Martin, about what he considered might be the oldest working steam locomotive in the world drew a number of interesting letters on the subject of ancient but hearty engines.

From New Zealand a reader sent me a newspaper cutting which tells how many of the veteran Government locomotives are being given new jobs on the privately owned lines run by logging companies, mills, and cement and lime works.

The oldest engine still in existence in the Dominion, apparently, is F13, which is an 0-6-0 tank used as a reserve at Lyttleton. It is some months since its powers were called upon, but to date it has covered nearly a million and a quarter miles—50 times round the earth !—since it was built in Scotland 80 years ago.

There is one, and only one, privately owned railway in New Zealand that carries passengers, and it uses three ex-Government locomotives, two of which were transferred quite recently. The line, 11 miles long, is run by the Ohai Railway Board and proudly boasts a section controlled by automatic colour light signals.

Loco in part exchange

Like any other commodity, the value of a second-hand engine depends on its age and condition, but, as a guide to the prices that are paid, a WAB class engine, which once hauled suburban trains on the Hutt Valley line, changed hands for £2,000 with a shunting engine traded in as part exchange !

It must not be assumed that all New Zealand's privately owned railways rely on ex-Government steam locomotives for their motive departments; new engines are also purchased. The Westfield Freezing Company bought a new six-wheeled saddle-tank direct from Britain about six years ago, and since then a second engine has been purchased by Wilson's Portland Cement Ltd.

Drive-it-yourself !

THIS is the age of make-it-yourself; but there was a time in the early days of motoring when, because of the scarcity of mechanics and garages, a breakdown often meant that the unfortunate driver had to repair-it-himself.

This prompted one enterprising journalist to provide what was probably one of the earliest do-it-yourself manuals on the subject of motoring. The *Manchester Guardian*, in its daily gossip column " Miscellany," quotes from this vintage work on the subject of a steering failure:

" Obtain two short scaffolding poles or other similar pieces of wood and lash them to the frame of the car so that they project five or six feet in front of the car. Borrow a two-wheel light cart, and turn it with its shafts towards the car, standing in front of the car with the shafts projecting back over the driver's seat.

" Now jack up the car and sling

Smoke Rings . . .

the ends of the scaffolding poles to the axle of the cart by the ropes, allowing a fair amount of swing if possible. The front wheels will now be off the road. Start up the engine, and drive the car slowly, steering by the shafts of the cart used as a tiller or ' Bath chair ' handle."

The *Guardian* points out, in fairness to tyros, that the author did not try this technique himself but " is indebted to *The Horseless Age* for the idea."

Engineering in English

I WAS delighted to receive a visitor from Sweden the other day—Mats A. Hede, from Stockholm. Mr Hede has been a constant reader of MODEL ENGINEER since 1919, when his father took out a subscription with the dual object of interesting him in models and in teaching him English. I am happy to say that both objects were achieved.

Mr Hede arrived in time to make his first visit to the ME Exhibition; he went to the Grand Regatta and also went to the Track Day at Malden. Altogether, he spent a fairly intensive few days and appeared to enjoy every minute of it.

It is very pleasant to meet readers from overseas and particularly so when, as in the case of Mr Hede, they take such an interest in the people and happenings of the magazine.

Fastest run

DURING the last decade or so, many live steam enthusiasts have emigrated to countries where the railway motive power is diesel or electric and they must feel very nostalgic about the vast network of steam-operated railways which, though diminishing, still play an important part in the affairs of the United Kingdom.

British readers must, therefore, bear with me if I mention occasionally, for the benefit of our overseas confrères, some odd tit-bit of information with which they are well acquainted but which is refreshing news to those who have left the Mother Country.

Such an item is the report of the crack run last month by the Caledonian, London Midland's new luxury express, which covered the 401 miles from Glasgow to Euston in 387 minutes. In this lively sprint it clipped 13 minutes off its own schedule of six hours and 40 minutes and three minutes off the pre-war Coronation Scot timing of six hours and 30 minutes.

The eight-coach train, which makes a stop at Carlisle, was hauled on this record run by the Coronation class locomotive No 46229, *Duchess of Hamilton*. The engine crew were Driver William Thomas Starvis and Fireman A. W. Wills, of Camden shed.

Eating to work

THE National Research and Development Corporation of the United States—a country where they seem to have less time for eating each day —has just introduced a 20th century type of snack which, in the process of time, will undoubtedly gobble up the sandwich.

Processed food, which contains all the carbohydrates, fats, proteins, minerals, vitamins and bulk that the average man needs for his boldily sustenance, is contained in a collapsible aluminium tube and is available in flavours like Bologna, Worcestershire and Black Walnut.

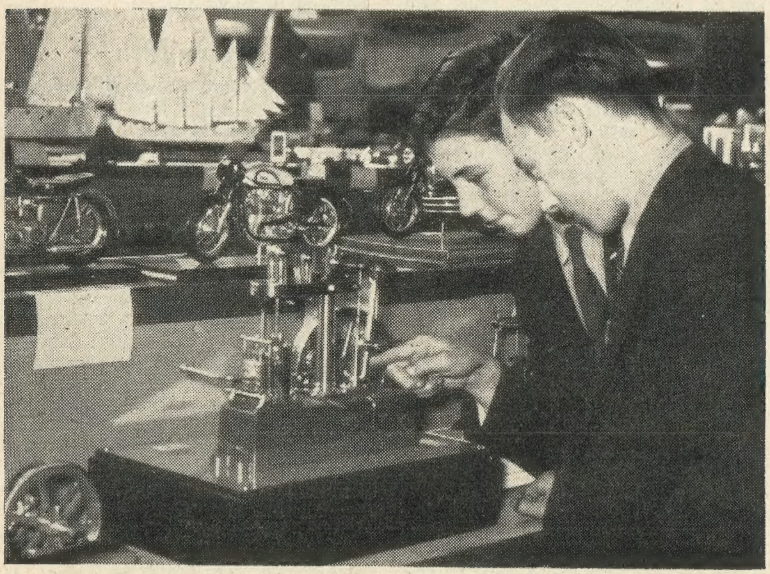
The manufacturers claim that the product will have great value in disaster areas, reports *Aluminium News*, and may be of great help to the harassed businessman who can press out a mouthful of fodder while chasing his train.

But there is a potential application in model engineer circles which may have escaped the manufacturers.

Think of the boon this will be to the home workshop engineer determined to get his bearings true to one ten-thou. He merely builds himself a simple, mechanical self-acting squeezer, seats himself at the lathe and the pangs of hunger need never disturb his search for perfection. Moreover, it has another tremendous advantage for the enthusiast who picnics in his shed—no more oily sandwiches !

COVER PICTURE

Alex Vicherov, who comes from the Ukraine, seen with his model tanker Mockba, which won the Championship Cup in its class at the Model Engineer Exhibition. It is built to a scale of 1 *in. to* 100 *ft.*



Two young visitors admire the Stuart Turner beam engine built by R. T. Martin

Hat-trick medallist

S. A. WALTER, of the Wembley club, is wondering whether he might have created a record in model engineer circles. When I met him at this year's Exhibition he told me that, for the third year in succession, he had gained a bronze medal in the general engineering section.

Neither of us could recall anyone else having achieved a hat trick with the same award in the same category, but if, in fact, someone can claim such a distinction I would be happy to print the facts.

Mr Walter, of course, will be chasing the " double double " next year by trying for another bronze and I don't quite know whether it will be wishing him luck to hope he gets a silver or a cup !

AT THE ME EXHIBITION

Review of general engineering

By Edgar T. Westbury

THE charm of the unexpected may be regarded as one of unlisted attractions of the ME Exhibition; one thing never found there is monotony. I have always regarded variety as the spice of life, and most essential to keeping up interest in models among a widely-varied community of enthusiasts; this quality was certainly not lacking in the present year's exhibits.

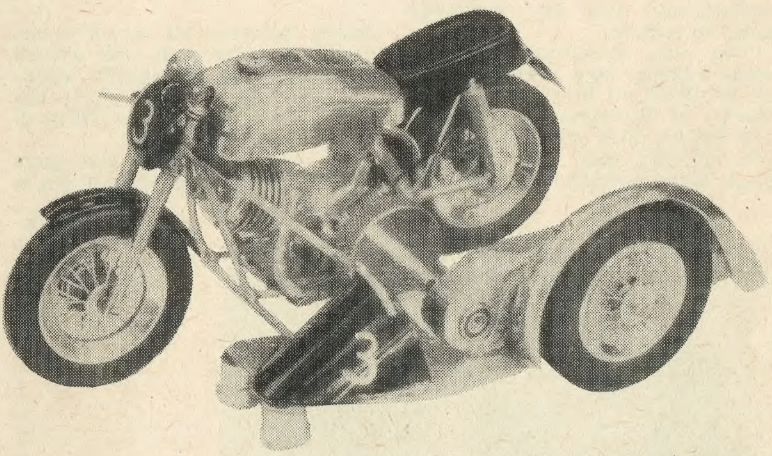
Models of industrial machinery, and textile machines in particular, rarely receive the attention they deserve as subjects for model engineering, but this year we were fortunate in seeing two excellent power looms, one on the Northern Association stand and the other—incidentally from the same region—in the Competition (General Engineering) Section, where it won the well-merited award of the Championship Cup.

No doubt the constructor of this model, T. W. Millward, of Manchester, being in the textile trade, had special facilities for obtaining all the necessary information for constructing the model, but this does not in any way detract from his achievement in the outstanding quality of workmanship and finish of the innumerable number of small working parts, all of which called for high precision. Proof of the practical success of the machine was there before one's eyes, in the check patterned fabric in course of being woven.

Another machine which gave evidence of its practical utility, by the inclusion of a sample of work, was the roller feed perforating press by W. R. Coombe, of Hayle. This machine, a specialised and little-known type of machine tool for producing perforated metal, generally resembles a blanking press, but is fitted with multiple punches and feed mechanism for dealing with large sheets of metal at a rapid rate.

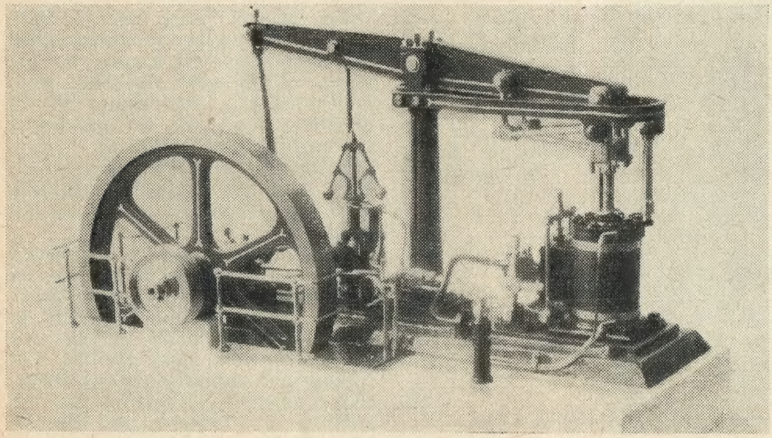
The Ruston excavator by A. J. Eaves and J. Hever, of Eynsford, reproduced with fair fidelity a machine with which we are becoming increasingly familiar nowadays, especially in development areas, though the details of its mechanism are not known to many, outside those concerned with its use. This model was electrically driven, incorporating three motors for lifting, slewing and travelling motions respectively, and was demonstrated in action, though an unfortunate mechanical breakdown marred an otherwise convincing performance.

Up to shortly before the closing date for entries, it looked as if the steam engine would be poorly represented in this section, but at the eleventh hour the scene changed; both in number and variety, steam engines were well up to the standard of previous years, and included all the main types of stationary period and modern engines.

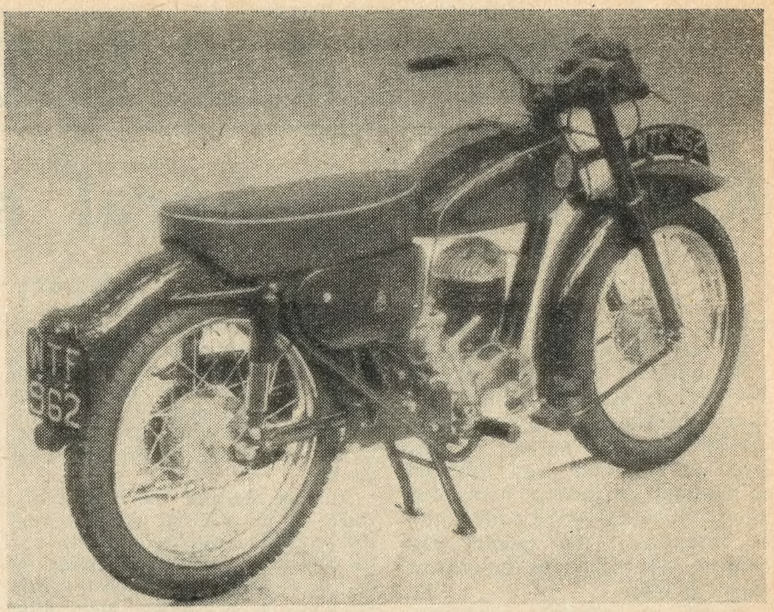


Above: Lionel Kirby's unique exhibit—a racing motor-cycle combination, in which the side-car wheel is the driven wheel

Below: A working model beam engine built by J. A. Elliott



Review of general engineering . . .



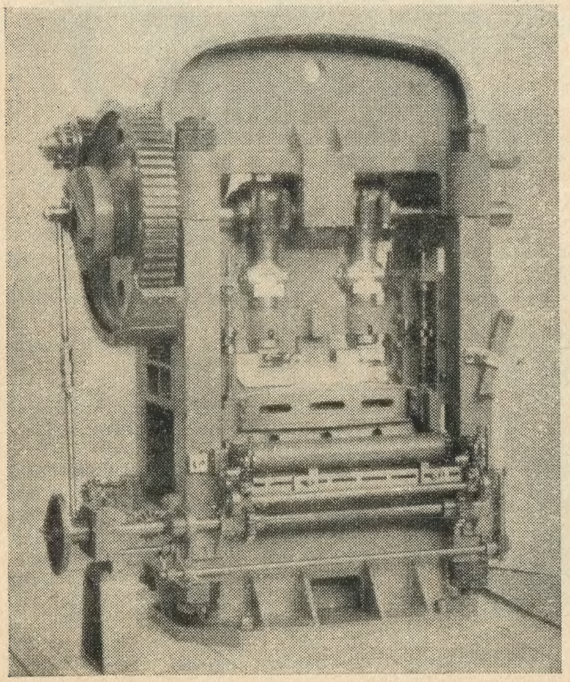
Leslie Tatlock's model of a Francis Barnett Falcon motor-cycle

Two of these were beam engines of the Stuart Turner type, one of them being a very competent Junior effort, and the other, elaborated in detail on the basis of information published in ME, was a good example of how a basically sound and simple design can be used as a nucleus for a more ambitious model.

Another beam engine, by J. A. Elliott, appeared to be of individual design, or copied from an unknown prototype; it was well made and attractively finished, but some of the pipework was not as neat as it might have been. The little Grasshopper beam engine by A. M. Donaldson was handicapped by its scale; the skill necessary in shaping its tiny working parts really accurately would have been in the realm of watch-making—and this the constructor failed to achieve.

Two very interesting horizontal steam engines were contributed by H. M. Webb, of Bristol, and K. N. Harris, of Rustington, respectively. The former, fitted with Stephenson's link reversing gear, was very well made, but unorthodox in many of its details, including the use of round, parallel eccentric rods with screwed and nutted ends (presumably adjustable for length). No doubt this feature was useful—but an offence to the eye of the purist.

The latter engine was even more unorthodox, not only in detail but in general design, as it incorporated many salient features rarely, if ever, seen in stationary engine practice, and more in keeping with locomotive design. The valve gear was the modification of the Joy gear designed many years ago by the late Henry Greenly, and the engine was equipped with jet condenser incorporating an Edwards type air pump. No doubt this engine was produced for experimental purposes, and this is a line of work deserving of much more attention, but to pursue the idea much further I would like to see engines adapted for comparative tests of different valve gears and other functional components.



This model of a roller feed perforating press, as used by the metal industry, was constructed and exhibited by Mr W. R. Coombe

INTERNAL COMBUSTION ENGINES

For several years now I have deplored the decline of interest in the construction of these engines, but the display in this year's Exhibition gives indications of a very definite renewal of activity in this line. The number of i.c. engines shown was not large—only seven in the Competition section, but they were of varied and interesting types, and moreover they were all good.

Two of the engines were constructed to the Seal Major (30 c.c.) design, by N. Cruddas and S. E. Hutson respectively; the former was modified in many details, including the use of a horizontal cross shaft for the distributor and circulating pump drives, and a different carburettor, also the addition of a water-cooled silencer,

but the latter was more generally in accord with the original designs.

Two very interesting experimental designs, by Dr C. R. F. Hewlett and G. D. Noble, deserve special commendation. The former was a split-single two-stroke of the two-crank type, incorporating an ingenious method of adjusting the phase of the crankpins, and charged by means of a free-vane rotary blower driven directly from the crankshaft.

In the second engine, built some years ago by a well-known pioneer of both steam and i.c. engines for racing boats, the Burt-McCollum type of sleeve valve engine, as employed in the high-powered Bristol radial aircraft engines, is the salient feature of design. Its incorporation in a small (30 c.c.) single-cylinder engine for a speedboat has been carried out in a most ingenious and workmanlike manner; every feature of the engine reflects painstaking care and forethought, including such details as the delay-action mechanism for opening the throttle and advancing the ignition.

It is, alas, one of the hard facts of life that the pioneer in any field rarely reaches the goal for which he strives. Neither of these two engines, to the best of my belief, has attained the hoped-for standard of performance; but such bold and ingenious experiments must never be written down as a failures, because progress can only be made by exploring unknown and untried lines of research.

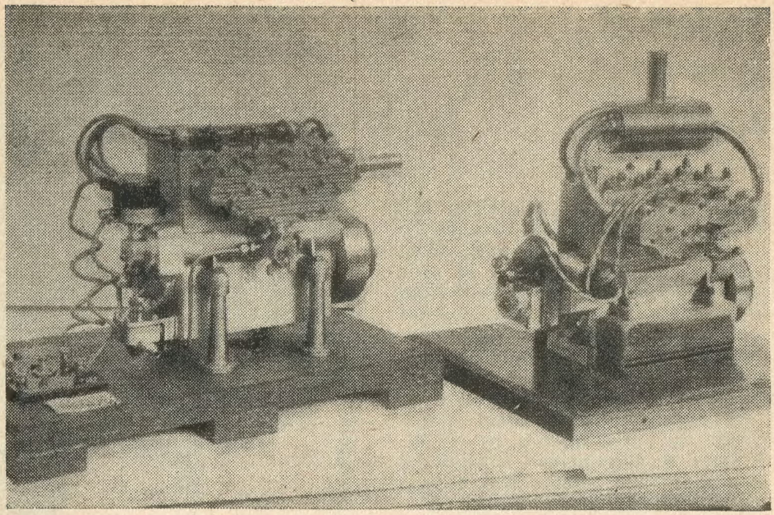
The sectioned Norton Manx racing motor-cycle engine by H. W. Hooper was a commendable example of a demonstration model, though not a "working model" in the generally accepted sense of the term. Two other engines, a single-cylinder two-stroke by Mervyn Vest and a 10 c.c. Dolphin o.h.v. engine by E. Field, showed conscientious and neat workmanship; the latter was stated to be a first attempt in lathe work, and as such deserves special praise.

The Loan section contained two very interesting petrol engines built some years ago by Mr C. C. Brinton; one of these was a model of an air-cooled V-twin, characteristic of contemporary motor-cycle practice, and the other an experimental water-cooled single-sleeve valve engine of 30 c.c. This is structurally very different from Mr Noble's engine, and much more generously proportioned, but it has been found capable of quite high performance, having produced 2 h.p. under test, at a time when this figure was extremely difficult of attainment in poppet-valve engines of similar cylinder capacity.

Although not entered in the i.c. engine class, the model of a Coventry-Climax fire trailer by L. J. King, of Bristol, being equipped with a working engine, deserves mention under this heading. The engine fitted is a single-cylinder 5 c.c. two-stroke, which in common with the rest of the model, appears to follow the design of that built during the war, and described in ME by R. H. R. Curwen.

The centrifugal pump, as well as the engine to which it is direct-coupled, is also a working model and will no doubt heave water very effectively, but a point of criticism is that the tangential delivery tract is not as neatly faired into the casing as it might be.

Another i.c. engine driven model is the ME Aveling road roller by W. T. Eridge, of Staines, which appears to follow the published design fairly closely and is well made and finished, though no information on its working performance is available.

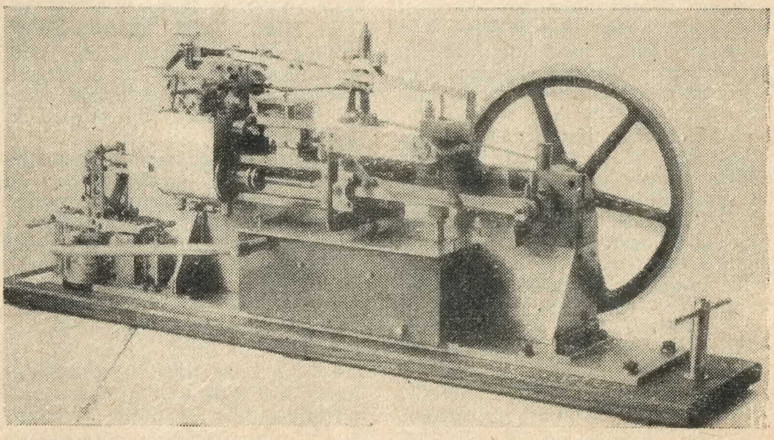


Two Seal Major four-cylinder petrol engines, by S. E. Hutson (left) and N. Cruddas (right)

MOTOR VEHICLES

Very few prototype models of cars or motor-cycles are equipped with working engines, because of the obvious difficulties in making them work in so small a size. Racing models, on the other hand, concentrate everything on working efficiency, and considered as models, are generally rather sketchy, except for the pains taken to produce accurate and shapely bodywork. The engines in nearly all cases are commercially-made compression-ignition or glow-plug types, but a good deal of ingenuity is exercised in the design and construction of transmission mechanism, which usually incorporates a centrifugal clutch and bevel or spur gears.

A novelty in this class of models was the racing motor-cycle combination by L. Kirby, of Wembley, in which the general layout, including the



An experimental horizontal steam engine by K. N. Harris

Review of general engineering . . .

engine proportions and location, followed prototype practice, though the drive from the engine was taken through an enclosed train of spur gears to the sidecar wheel. No clutch appeared to be fitted, and it was not quite clear whether the engine was individually built or adapted from a commercial type; but in any case the arrangement was most ingenious.

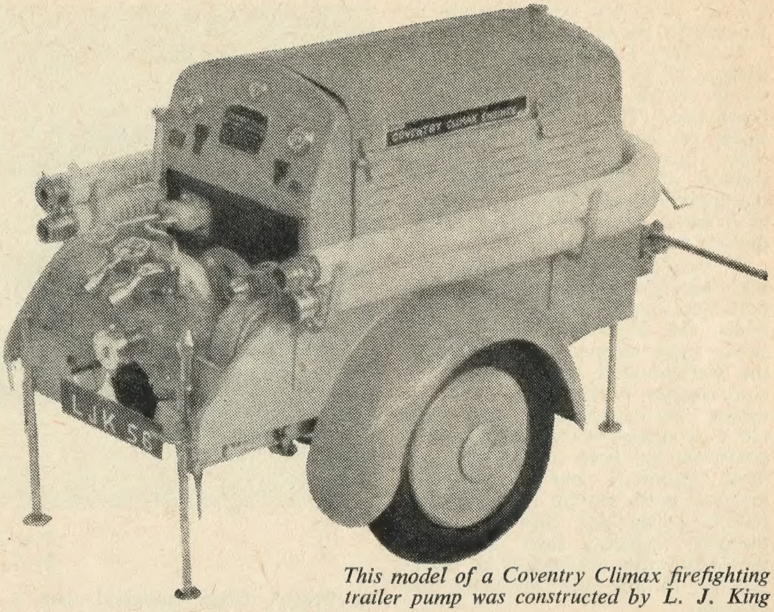
Of the non-working model motorcycles, the three exhibits by H. W. Hooper, of Birmingham, upheld the standard of this prolific worker, who has contributed several models of a similar type in past years. The model of a Francis-Barnett Falcon, by L. Tatlock, of Kearsley, however, reached a standard of perfection seldom seen in this class of model, in workmanship finish and fidelity.

NON-WORKING MODELS

The distinction between this class and those intended to work is a very fine one in many cases, because they may have all working parts complete and mechanically accurate, although not truly functional. An outstanding example of this was found in the model of a 9.2 in. breech-loading gun on railway truck mounting, by S. A. Walter, who is well known for the models of ordnance he has previously exhibited. In this particular case, some minor criticism of the gun itself and its mechanism was encountered, but the details of the mounting were very well carried out.

A non-working model of a national gas engine, by H. F. Spurr, of Birmingham (recently described in ME), showed careful attention to detail and scale fidelity, but I think it a great pity that a model on which so much work had been expended was not made to function, as it undoubtedly could be.

Architectural models are always something of a headache to the judges, because it is possible to make a spectacular model of this type without a great deal of effort or real skill, or on the other hand, to exercise both without much to show for it. The model of Wargrave Close, by B. C. W. Windle, who lives in that vicinity, appeared to strike a happy medium, and his work was capable of standing up to the most minute scrutiny. A bungalow built in plastic materials by A. McIntosh, of Bromley, was quite pleasing, but did not attain true characteristic finish.



This model of a Coventry Climax firefighting trailer pump was constructed by L. J. King

An outstanding object lesson in the effective use of plastics, however, not to mention super-detailed craftsmanship, was seen in the model of a cathedral in Perspex by J. Given, of Sunningdale. This did not, apparently, represent any particular cathedral, but was true in character and accurate in the smallest details, including statuary. A very clever device which imparted realism, despite what might be considered the limitations of the material employed, was the treatment of surfaces by cross-hatching or slight roughening, to produce an impression of solidity without destroying transparency. The tools used in making this model were of the simplest and most primitive type, which obviously adds credit to the achievement.

A working model of the ME Vulcan beam engine in Perspex, by Sir W. Guy Fison, quite understandingly aroused some criticism, but quite apart from its merit as a demonstration model, it embodied some very neat, intricate and painstaking workmanship.

The carvings of military figures by V. H. Washer, of Kings Langley, who seldom fails to produce something of interest each year, provided a colourful tableau, and showed careful observation of uniforms and trappings.

CLOCKS AND INSTRUMENTS

These were less numerous than they have been in some previous years, and also to some extent less interesting, though they were well up to standard in workmanship and finish. As usual, A. E. Bowyer-Lowe showed an excellent example of modern trends in horological design, in the Shortt free pendulum clock, which represents the latest development in accurate timekeeping, and is employed in observatories all over the world for this purpose.

Another prizewinning exponent of this class of mechanism, J. C. Stevens, exhibited an overscale working model of the Duplex watch escapement, together with its driving train and spring, which kept it in motion throughout the Exhibition. This type of escapement is not used in modern watches for various practical reasons, but it is capable of reasonably good timekeeping, and the large model enables its operation to be readily observed.

The patented clock by T. A. Ching was driven by a synchronous electric motor, the main point of interest in it being the method of subdividing periods by a special arrangement of the dial and hands.

We have seen several examples of home-built cameras at past Exhibitions but never, I venture to say, a more remarkable example than that shown by F. J. Newcombe, of Bristol. This was based on the design of the famous Leica, and the only information available for its construction was that obtained from a handbook on this camera.

Except for the actual lens grinding, all parts were made by the exhibitor, including the iris diaphragm, focusing mount, range-finder and focal plane shutter, and the workmanship of these high-precision and intricate components was at least up to the standard of the professional manufactured product. ■

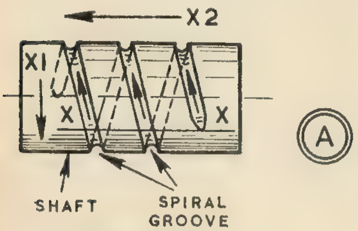
Oil grooves and slingers

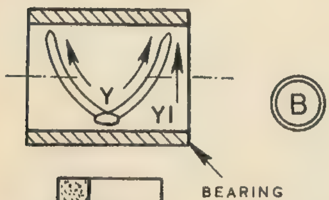
By GEOMETER

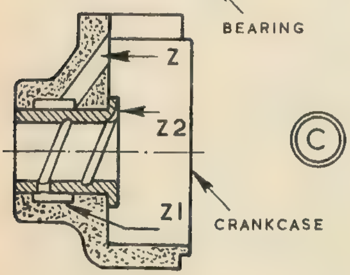
Taking advantage of the friction and mass of a fluid lubricant like oil, a suitable single groove, or simple system of grooves, can be utilised for two different purposes in engines and machines—1, to carry the oil into bearings; 2, to prevent its escape from bearings and casings where retention is essential.

In the first application, lubrication may be much improved with consequent extension of the working life of shafts and bearings; while in the second application there is the advantage that, frequently, parts performing another function suffice for the oil retention—no extra parts being needed solely for this purpose.

The principle is that of the Archimedean screw "pump," in which a tube is wound in the form of a spiral or thread, situated at a slight angle to the horizontal with its lower end in water, and rotated for the water to be discharged at the upper end.

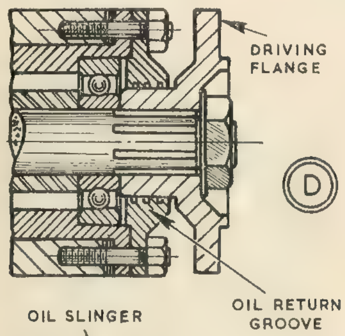


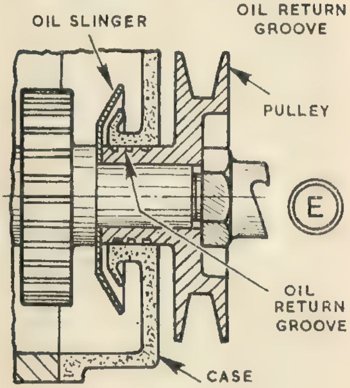




In the same way oil can be displaced between a shaft and bearing, or between a boss and the bore of an enclosing casing.

How this occurs is represented diagrammatically at *A*. The spiral groove is a continuous one as can be cut by setting a screwcutting lathe to a coarse pitch. Taking a stationary section, such as *X-X*, which may be part of the supporting bearing surface, and turning the shaft in the direction *X*1, there is a tendency to push oil in the groove in the direction of the arrows, and in relation to the axis of the shaft, in the direction of arrow *X*2, from right to left.





Thus, on the most elementary view, if it is a case of lubricating the shaft and bearing, the point of entry of oil should be to the right, so it is carried into the bearing; if the point of entry is on the left, oil will continually be drawn from the right side, which may not receive enough. On the other hand, such a thread would prevent loss of oil towards the right from a casing on the left. To maintain these effects with a shaft rotating in the reverse direction, the hand of the spiral would need to be changed from the existing right-hand to a left-hand one.

In practice, the shaft is usually plain because of the cutting action a groove would have on the bearing; and the groove is formed in the bearing. Then, the spiral must be the reverse hand; that is, where a right-hand spiral would be correct for the shaft, the bearing must have a left-hand one. Alternatively, as at *B*, where the feed is central, point *Y*, a pair of grooves leading off right and left will carry the oil across the bearing, with a direction of rotation *Y*1.

For the plain bearings of an enclosed model, or the timing gear bearings of a motor-cycle engine, a type of "automatic" lubrication can be arranged on the principle at *C*. In crankcase or timing case, oil may be splashed to run down a hole *Z*, passing to the end of the bearing or into a groove round the outside, *Z*1, whence it enters through a hole into the spiral groove of the bearing and is "screwed" back to the point *Z*2.

For oil retention, in a car rear axle for example, the pinion shaft driving flange may have a plain boss, and the end cover carry the oil return groove, as at *D*; and on an engine timing case, the pulley boss may have the oil return groove, and the bore for it be plain, as at *E*. Trouble with oil escaping may occur with developing wear on the ball bearing, or if the timing case is not centred on the pulley boss.

Oil slingers or throwers, which may be used with or without return threads, require a much faster speed of rotation, and are employed in housings or cases where there are channels to take the oil thrown off by centrifugal force. Correct fitting for such slingers, as at *E*, is with the cupped side facing the case. ■

The clock that was

"YEARS AHEAD OF ITS TIME"

By B. S. T. Wallace

The Eureka was the first battery-driven domestic clock in the world

This model well illustrates the final phase of the Eureka design

The half century of what is known both here and in America as the Eureka patent and which covers the world's first domestic battery driven clock—made in the heart of London's own clockland—has just passed.

Although the manufacture of this patent did not commence until 1909 the moment seems opportune to recall the advent of this unique clock because the ingenious and highly efficient electro-magnetic system invented for it has, with slight modifications, recently been embodied in the world's first electric wristwatch now on sale in America and which has, in the view of those competent to judge, come to stay. The Eureka patentees must have been possessed of intelligent anticipation for they included watches in their patent specification fifty years ago.

The concept of the Eureka patent was revolutionary. It not only aspired to supersede the electrically-driven cumbersome rod pendulum by a compact rotary pendulum, designed to provide a domestic clock capable of a three-year run by means of a simple battery similar to that hitherto attained only with the former, which was too bulky and awkward for normal household use, but it also aimed at the abolition of spring driven clocks.

It is not intended to go into all the technical details of the Eureka clock but a résumé of, and a few sidelights on, the company's activities, helped by the photograph of five of their clocks from a collection in my possession, may be of interest.

First, as a matter of historical record, it should be noted that the electromagnet used in this new device was the first piece of electrical apparatus in this country to be wound with enamel insulated wire.

Enamel has since become the universal material for insulating wires for all electrical purposes, although at the time of its introduction it met with a dubious and even hostile reception, arousing as much controversy among electrical engineers as the clock itself did among horologists. So in more ways than one the Eureka clock was "years before its time."

The representative collection of Eureka clocks illustrated, embraces the five year production period of the Eureka Clock Co. from 1909 until the outbreak of the first world war when the loss of their skilled electrical instrument makers to the war effort compelled the company to close down. The patent was allowed to lapse in 1917 when it became evident that future production of the clock would become too costly.

Each Eureka movement was given an individual serial number engraved on a brass disc or plate. When the movement was fitted into a case, that case also bore the number of its movement, usually in writing, together with "Made in England" embossed on it if it happened to be one of their own handsome handmade specimens.

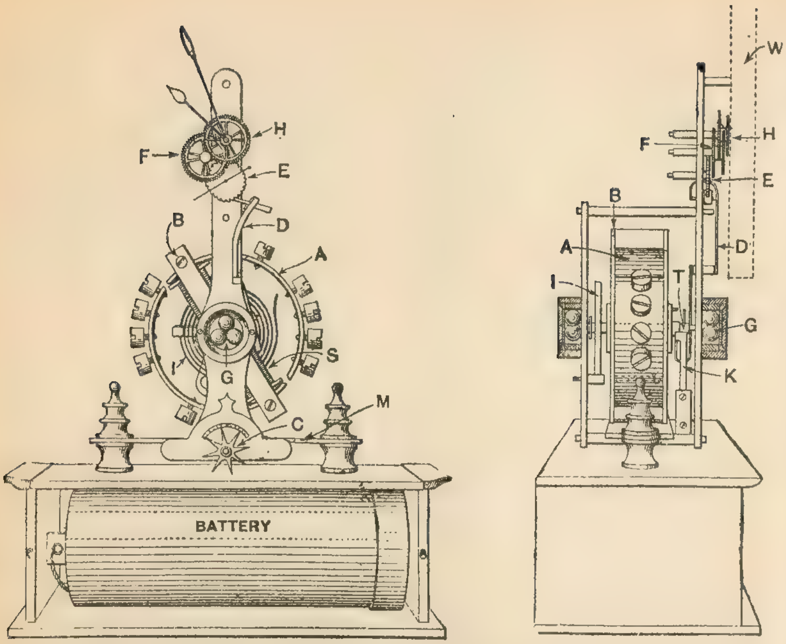
The earliest clock among those shown is No 154 in the mahogany bracket case, second in line, and on the dial of which is engraved "1000 day electric clock"; while the latest, in the bevelled glass lantern case, No 9119, was among the last turned out.

Less than 10,000 clocks in five years was a relatively small output, but the Eureka clock was virtually hand made. The demand was always greater than the supply. They were difficult to get, being issued at prices well above those of conventional clocks through a few select stores. There was also a big overseas demand, following King Edward VII's interest in the venture, and clocks in the 5000 and 6000 series were mainly diverted to that market.

One result of this difficulty in meeting the demand is reflected in many of the closed models where appearance was of little account. The brass parts were not finished off, the outside surfaces being left as cast. Bearings and all essential working parts, however, were always correctly finished and well above the standard found in most clocks.

The five models illustrated show the different styles of case used and the development of the clock. A change in the layout of the movement in the later period of production was only superficial, as will be seen. There was no alteration in the fundamental parts or working of the clock.

Many of the early Eureka clocks were totally enclosed, so their interesting mechanism was not visible. The bracket clock already alluded to is a good example of this type. The company was primarily concerned with the production of a clock that would run for at least three years on one battery and keep good time.



A, Balance Wheel. B, Electromagnet Horse Shoe. C, Regulator. D, Lever. E, Second Hand Wheel. F, Minute Hand Wheel. G, Ball Bearings. H, Hour Hand Wheel. I, Isochronic Hair Spring. K, Brush Finger. M, Steel Armature. S. Coil. T. Contact. W, Clock Dial.

The mechanical arrangement, in side and front elevation, of the original Eureka clock

They catered for all tastes by using every type of case popular at that period.

It was soon found that the oscillating wheel proved a great, an almost mesmeric, attraction, so a number of these movements were mounted on a heavy circular gilt brass base fitted with a domed glass cover. The rectangular cased model shown first in line, No 3293, was originally one of these and better finished than most. Owing to the difficulty in replacing a broken glass cover a Perspex case was made to rehouse this clock completely and give it a modern look. It also runs on a modern Mallory cell less than one cubic inch in size.

Where a glass cover was not appropriate, the practice developed of leaving a large hole in the centre of the dial to permit a glimpse of the wheel. This was very effective with the 16 in. dial shown, No 4637, in which the whole wheel is visible through a 5 in. opening.

In the instance of the tall Sheraton model, the works are only partly visible through the dial but sufficiently so to arrest attention and arouse curiosity; particularly as this case is airtight and the gold lacquer on the brass and nickel plating on the iron have remained virtually untarnished for half a century.

This model is of special interest. The movement is arranged to fit into a circular cavity. This was achieved by dispensing with the usual supporting pillars, the weight of the very heavy movement being taken by a substantial brass dial housing.

A specimen of this rare compact movement has been fitted into the circular brass case from a ship's clock and is giving an excellent performance at sea.

The last model

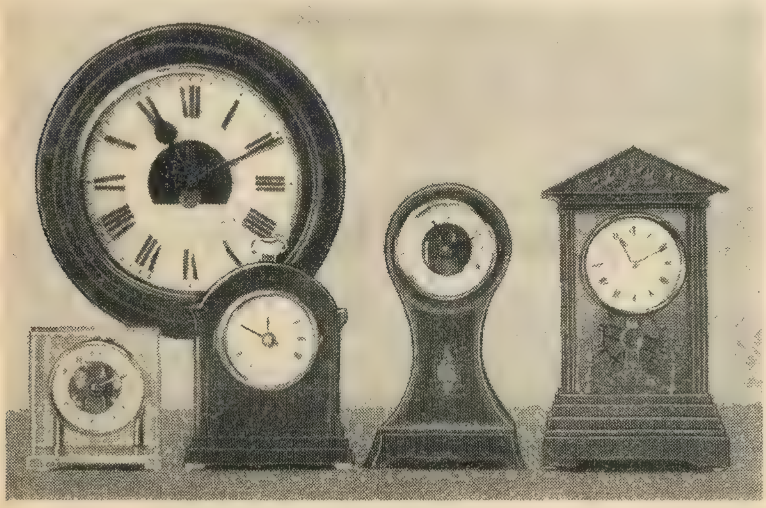
In the models described so far, the wheel is disposed behind the dial and train which partly obstruct a view of the wheel from the front. Demands to see more of the wheel and better visibility for the hands led to a change in the layout of the movement for this purpose. All models above serial No 7000 were so designed.

This involved little more than an alteration in the disposition of the bell crank lever which enabled the dial, with the train behind it out of sight, to be placed aloft, leaving the wheel in full view, rolling on its own, so to speak, with a really first class unobstructed dial. All working functions remained unaltered and both types of movement are identical in operation.

The first of the exposed wheel models showed the whole wheel below the dial but it made the clock too tall and ungainly; so a compromise was reached in the lantern model illustrated in which the dial slightly overlaps the top of the wheel, giving a better balance to the whole layout. This model was the last and probably the best that was made.

A whole book could be written on technical aspects of the Eureka clock. Its apparent simplicity is deceptive. Theoretically, it is rather complex and complicated by several interdependent and interlocking factors. The most vital part of the clock is the contact system which is, and must be kept, up to the standard of contacts used in telegraph systems.

It is useless to imagine these contacts are a simple make and break similar to those in an electric bell; their closing and opening must be accurately



The author's collection of Eureka clocks

timed relative to both the position of the electromagnet and its self-inductance. The correct amplitude of 180 deg. each side of the zero position of the wheel will not be attained unless the contacts are in order.

There is another important point concerning the Eureka contacts. The model in the Sheraton case is so enclosed that it is almost impossible for an untutored person to start the clock by fingering the wheel without damaging some vital part; consequently it is, as it should be, adjusted for automatic self-starting as soon as a battery is connected to it. The clock can only be stopped by disconnecting the battery. In other words: when the wheel is at rest the contacts should be closed. This also ensures that the impulse is given to the wheel when it is in the neutral position just as it is about to meet the resistance of the spring, similarly as when a rod pendulum is impulsed when about to "feel its weight."

Although the Eureka contacts hold no terrors for anyone accustomed to handling low-current-operated devices they are a stumbling block to the uninitiated. With modern materials and technique these contacts could be made foolproof.

Running continuously 40 years

Concerning the long term performance of Eureka clocks, the 16-in. dial model illustrated has been running continuously for over 40 years with all its original parts intact, except for the renewal of a worn contact tip. Being housed in a garage to give the time over a large garden it is subjected to extremes of heat and cold. It is never more than a minute or two out in the course of a year and is rarely touched beyond checking the need for oil when a battery is replaced.

The four other clocks shown are all capable of a seven-year run on the large single dry cell specified by the makers. One of them is working on a cell ten years old and now reading 1.25 v. Taking these, and the general run of dozens of Eureka clocks the writer has handled, if a timekeeping accuracy of within a minute a month cannot be attained then it is a firm conclusion that there is something wrong with the clock or its adjustments.

The most common cause of apparent variation of rate in much handled Eureka clocks, which otherwise appear to be working well, is the failure of the ratchet wheel intermittently to feed forward, or it may intermittently be notched up two teeth instead of one if it has been knocked about a bit. Very few, indeed, of the remaining Eureka clocks have escaped damage or interference of one sort or another.

Although the ratchet mechanism is perfectly safe and sound in its original condition it can easily be inadvertently or unknowingly put slightly out of adjustment by careless handling of the movement when out of its case, in which event it requires long and patient watching to detect the trouble. An average of one tooth failure out of every five hundred operations means a time error of ten minutes or more in a week.

The reason why, in the past, so much controversy has centred around the Eureka clock—why so many of them were needlessly ruined—was due in part to the failure of the company to issue adequate technical information and maintenance instructions with their clocks but mainly it was due to the absence of the necessary specialised knowledge and equipment on the part of those handling them, for this clock requires 90 per cent practical electromagnetic experience well above amateur grade and 10 per cent horological knowledge.

Ignorance has been responsible for such fantastic statements that the Eureka clock is affected by the earth's magnetic field. The magnetic system of this clock is both powerful and highly efficient, there being practically no flux leakage. Not only is it many thousands of times stronger than the earth's magnetic field, it is also completely screened from it. The earth's field has no more effect on a Eureka clock than it has on a trolley-bus.

To me it is a sad and sorry thing to see England flooded with finnicky unsubstantial foreign battery-driven clocks after pioneering with the world's first and certainly the most interesting ever made.

The havy ¾ lb. Eureka wheel is far superior to the various fragile light pendulum types of battery clock which all require careful levelling, will not stand vibration, nor readily permit that most essential of household operations: moving the clock to dust the shelf.

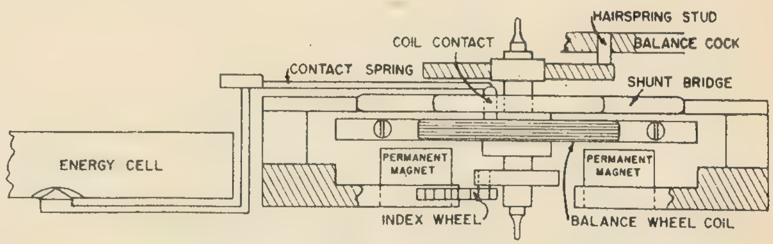
If progressive spirits fifty years ago thought it was time to produce a portable clock that did not require continual winding, it is surely an anachronism that in this electronic age, so many iron age clocks are still being manufactured; and these are getting worse and worse: all face and no guts.

There is very little hope or scope for any material improvement in spring driven clocks whose motto is "born to be broken." The world's time standards and the timing mechanisms for the international synchronisation of printing telegraphs and scrambling of radio telephone calls, which must be accurate within a fraction of a second, are all driven electrically.

The model engineer has a wonderful and unlimited field for devising the ideal home electric clock which, apart from keeping good time, must also be self-contained and unfettered by trailing wires; be portable and transportable without upsetting its operation; be self-starting and noiseless; and require an easily renewable battery of reasonable life.

HAMILTON ELECTRIC WRISTWATCH

This herald of a new age, now on sale in America, and for which a very high timekeeping accuracy is claimed,



Details of the mechanism of the Hamilton battery-driven wristwatch

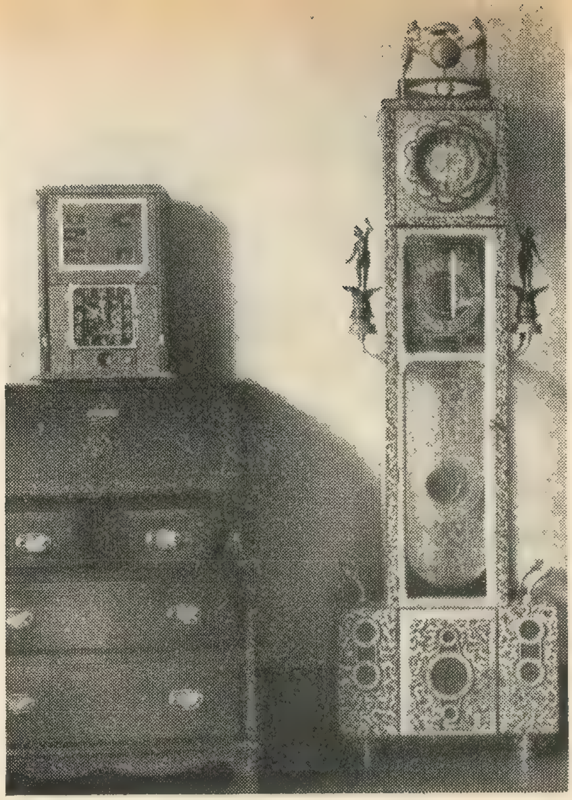
operates on the same principle as the Eureka clock, but with modifications necessary for the much quicker oscillation of the balance wheel.

A few facts and figures supplied to me by the company well illustrate the extreme miniaturisation in electrical apparatus that has been developed the world over for guided missiles and other electronic equipment.

The Hamilton electro-magnetic balance is wound with wire only 0.0006 in. thick—much finer than any wire normally stocked—to a resistance of 3,000 ohms. There is no iron core to the electromagnet so instead of an armature it is activated by two tiny platinum-cobalt permanent magnets weighing 0.005 of an ounce. This reduces the self-inductance of the system and permits the rapid magnetisation and demagnetisation which takes place every 0.4 sec., the current in this operation being limited to about 4 microamperes.

● *Continued on page* 390

PENALLY'S CALENDAR CLOCK



A veritable mechanical genius—JOSEPH MARTIN is convinced that he's a wizard!—created this fascinating magical clock . . .

ANYONE spending a holiday on the lovely Pembroke coast may meet the Wizard of Penally. The old magician, now in his seventies, lives alone in a house with gay decorations on the door and imitation cactus plants in the garden. When the front door is opened, a mechanical box displays one of twenty quotations—and there, on the doorstep, is William George Whittle.

Everyone in Penally knows Wizard Whittle, his gay house and garden in Giltars Terrace and his remarkable clocks. Using scrap, he constructed in 1939 a calendar clock which gives the time of day, the full date, and a reminder of leap-year.

Every three days the calendar clock is rewound, the notice *Rewind* swinging automatically across the pendulum window as due warning. The time taken for the midnight change-over is four seconds—even on New Year's Eve. The February variations from 28 to 29 days and the 30-day months are provided for in two to four seconds longer "according to the number of surplus dates to be run out."

Manual corrections are not needed. "This clock takes everything in its stride for all leap-year operations," explains Mr Whittle, "and no complex gearing is required to accomplish this end."

There are two windings, one for time and the other for the calendar. When fully wound the calendar winding will operate a five-date system sufficient to cover a February of 28 days—the longest run. The date-plate band uses a locking device when at rest.

Should the owner have been away for a period, the calendar readings can be worked manually by flicking over a lever. A simple device puts the spring motor out of operation while the required date quickly appears, and if the operator forgets to replace the lever it returns automatically to its normal position when the spring motor takes over again.

Through a mechanical arrangement, which Mr Whittle describes as simple, the clock provides for all dates up to the year 1999—far enough into the future for even a Welsh wizard.

It took Mr Whittle close on six months to work out a method that would be reasonably simple while combining all the phases of a calendar clock and embracing the whole of calendar operations without manual corrections for a leap-year. Once having discovered a satisfactory way of providing for the short months, he found leap-year comparatively easy.

His biggest problem was accuracy. But with mind conquering matter, for he had only ordinary mechanic's tools at his disposal, he achieved it. And because he did not possess a lathe, he fitted a hand-brace to a vice and went to work on a kitchen table, his late wife often using one end while he used the other.

They were then living in a small flat. Mr Whittle had just retired at 58. For fifteen years he had been collecting mechanical scrap without an idea of what he would eventually do with it—until the strange absence at that time of calendar clocks inspired him to an attempt whose results were far beyond his expectations.

He has also constructed a large clock (shown in the picture) surmounted by two figures which strike the hours and half-hours on a twelve-hour shift, and flanked by two statuettes, which are lit up in late afternoon, when other lights illuminate the clock face, until late evening. Three cycle-light batteries, lasting nearly six months, supply the current for the lights while the clock itself is, like the other, rewound every three days on automatic notice.

I am left with the suspicion that the ingenious people who build calendar clocks are secretly grateful for the difficulties of leap-year and that they would rather have Julius Caesar's calendar, with February 24 counted twice, than the World Calendar, approved by some fourteen nations, in which every year and every quarter begins on a Sunday and it is always on a Sunday night that you hang up your stocking. ■

A 60 c.c. HORIZONTAL GAS ENGINE—5

By EDGAR T. WESTBURY

Continued from 29 August 1957, pages 290 to 292

This week the author writes about the mechanism operating the valve gear

THE use of "skew" or spiral gears for driving the camshaft in engines of this type may be regarded as a disadvantage in some cases, as there are not many constructors who are prepared to go to the trouble of cutting such gears themselves.

It is by no means impossible to do so, however, with the aid of a screwcutting lathe fitted with simple attachments, and articles dealing with methods and calculations for producing suitable gears have appeared in previous issues of the ME. But most constructors will prefer to make use of ready-made gears if they are available, and before settling the design of the engine I made a point of finding stock gears which could be utilised with slight adaptation; these will be obtainable, together with castings and other essential materials, in due course.

A few words on the subject of spiral gears, in their application to shafts at right angles to each other, may be opportune here, as they do not appear to be as well understood as they might be, to judge by inquiries constantly encountered on the subject. They may be regarded as a development of worm gearing, generally most suitable for low reduction or even ratios; in some cases they are used for step-up or "overdrive" ratios, such as the high-speed shaft of a centrifugal cream separator.

Like worm gears, they introduce a certain amount of end thrust on one or both shafts, depending on the torque transmitted and the angle of the teeth. Their mechanical efficiency is not as high as that of spur or bevel gears, due to sliding friction between the meshing surfaces of the teeth, but if well-finished and of suitable material, they run silently and give long service; worn gears can be given a new lease of life by shifting them slightly endwise.

In common with all other gears, the speed ratio of any pair of skew gears depends on the relative numbers of teeth in them, but this is not necessarily proportionate to the pitch diameters of the gears, as it is influenced by the angle at which the teeth are cut. Thus it happens that a pair of timing gears having a ratio of 2 to 1 may be approximately the same diameter, by making the pitch angle of one about twice that of the other. This is found perplexing to many querists, one of whom, in criticising the design of one of my petrol engines having a skew-geared camshaft, assured me that "it could not possibly work, because both gears were the same size."

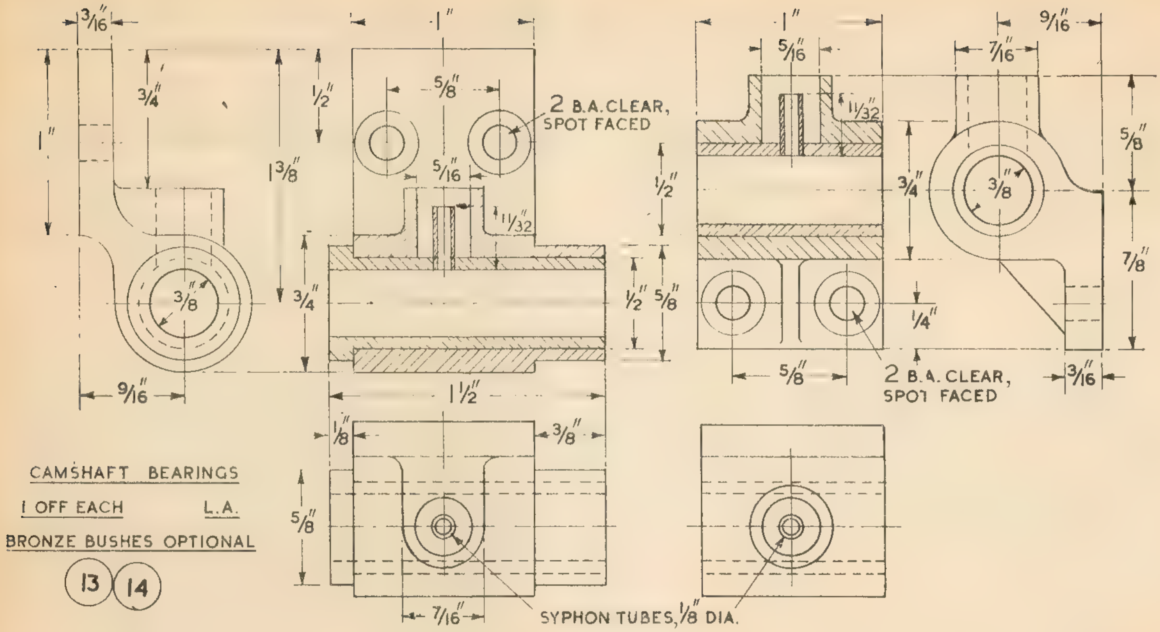
The present design is arranged to use gears having centres 7/8 in. apart, and any combination which gives 2 to 1 ratio at this distance can be utilised. Suitable gears can often be obtained from motor-car distributor or speedometer drives; the ratio is easily ascertained by counting the teeth, usually few in number. If the centre distance is either greater or less than 7/8 in., the camshaft can be displaced either upwards or downwards to suit, as the position of the bearings can be adjusted; but any serious discrepancy in this respect affects the geometry of the valve gear, and may call for alteration of the valve rockers.

Precision ground mild or silver steel may be used for the camshaft, which does not require machining, and need not even be cut to length until final fitting is completed. Note that an extension of the shaft is necessary if a governor is to be fitted. The timing gear and the two cams for inlet and exhaust are pinned in position after timing adjustment has been settled; for initial fitting they should be bored a fairly tight fit on the shaft. This applies also to the contact-breaker cam, in cases where coil ignition is employed.

CAMSHAFT BEARINGS

Parts Nos 13 and 14 may be made either in light alloy or bronze; the latter, of course, dispenses with the need for bushing, but a good aluminium alloy without bushes will give quite long wear, and may be kinder to the shaft than a hard bronze. Both bearing housings have a flat bolting face for attachment to the main bed plate and water jacket respectively; this should be machined exactly parallel with the bore of the bearing, and a sound method of ensuring that it is so is to fit both the housings together on a true mandrel, after boring, and machining the faces at one setting, in the four-jaw chuck or on the face plate, with the mandrel set truly square with the lathe axis in either case. Alternatively, the faces may be filed true, using the mandrel to check parallelism on the surface plate or other flat surface.

The bearing at the cylinder end has an extension machined on the outside to form a seating for the contact-breaker, but if this is not required, it may be machined away. Lubrication of the bearings is by wick oilers, having a well 5/16 in. dia. × 3/8 in. deep, and a 1/8 in. brass or copper wick tube, 11/32 in. long, screwed 5 BA to fit in the centre. Knurled caps having the skirt split across to provide a friction fit (part No 31) serve as dust covers for the oil wells.



If the facings on the bed plate and water jacket are correctly machined, no trouble should be encountered in lining up the camshaft bearings, but any discrepancy in the level of these surfaces can be adjusted, if necessary, by means of shims; it will be better, however, if the need for them can be avoided.

To test the alignment, a close-fitting mandrel should be inserted through the bearings and the contact faces smeared with marking colour (such as "mechanic's blue"); they should bed down over the whole surface, thus ensuring that when bolted in position, the bores will be in exact alignment.

The camshaft, with the timing gear in position, may now be inserted through the bearings and their location adjusted to give correct meshing of the gears, which should be such as to allow of just the least suspicion of backlash in the teeth, with the shaft axis exactly horizontal. Fixing holes may then be drilled and tapped, and the bearings secured by studs or setscrews. Some constructors may prefer to provide more positive and exact location by fitting dowels to the seatings, but I do not consider this essential, provided that due care is taken in any subsequent assembly.

INLET AND EXHAUST CAMS

Part Nos 23 and 24 are of a very simple type and can be produced without any special equipment. In previous articles on i.c. engine construction, I have laid great stress on the need for accuracy in producing the cams, and recommended that the two cams should be made in one piece so that their relative location can be positively ensured.

This, however, applies particularly to high-speed engines where the cam functions are critical; it is by no means so important in engines which run at slow or moderate speeds, and in this case angular location of the cams is influenced by the use of pivoted rockers, instead of straight-line motion of tappets both in the same plane. As a result, it will generally be found easier to make the cams separately and locate them by trial, finally fixing them in position by taper pins.

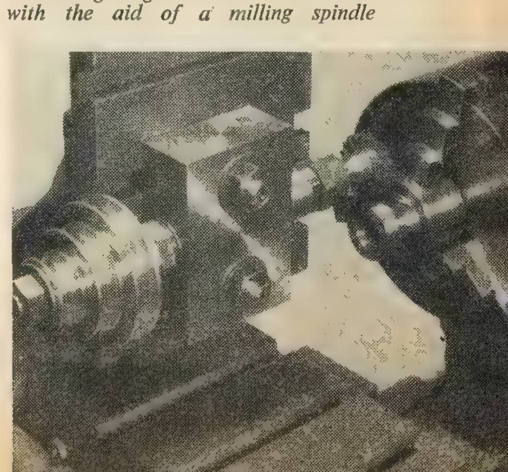
It will be seen that the cams are of the tangential flank type, as employed in most orthodox full-size gas engines, and it is possible to produce them by hand filing, without mechanical aids, though this calls for a fair amount of skill, and it is not easy to measure angles accurately on small components.

If this method is adopted, I suggest that after turning up the blanks, the first operation should be to file the flanks dead straight, at the appropriate angle to each other, which may easily be tested at this stage with an ordinary bevel protractor. In the case of the exhaust cam, which has a lift period of 120 deg., the included angle between flanks is 60 deg., and that of the inlet cam is 70 deg. The depth of the flank, or in other words, the diameter of the base circle, may be indicated by a "witness" circle produced on the end face of the blank with a point tool, and the superfluous metal removed down to this level in any convenient way.

In some of my earlier articles on i.c. engine construction, I described the use of a roller filing rest for forming tangent cams, and this method has great advantages over hand filing, in respect of both flank angle and base circle concentricity. Some method of indexing the lathe headstock to the required angular positions is, of course, necessary; the filing rest is adjusted to a level equal to the base circle radius above the lathe axis (in this case $\frac{3}{8}$ in.) and the two flanks filed down to this level. The work is then inched a degree or two at a time and filing continued to produce the base circle.

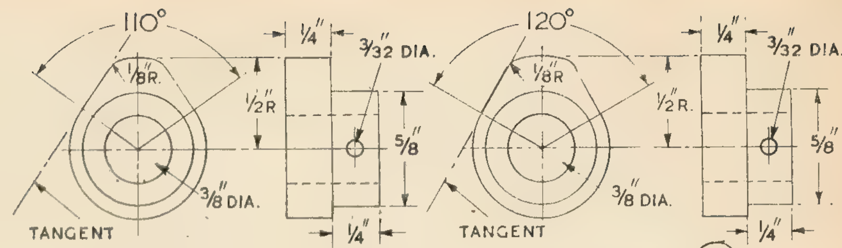
If milling equipment is available, the same methods of indexing the cam blank can be adopted, and the operation is equally straightforward,

Machining tangential cams in the lathe with the aid of a milling spindle



GAS ENGINE

continued



(23) INLET CAM EXHAUST CAM (24)

1 OFF EACH M.S. C.H.

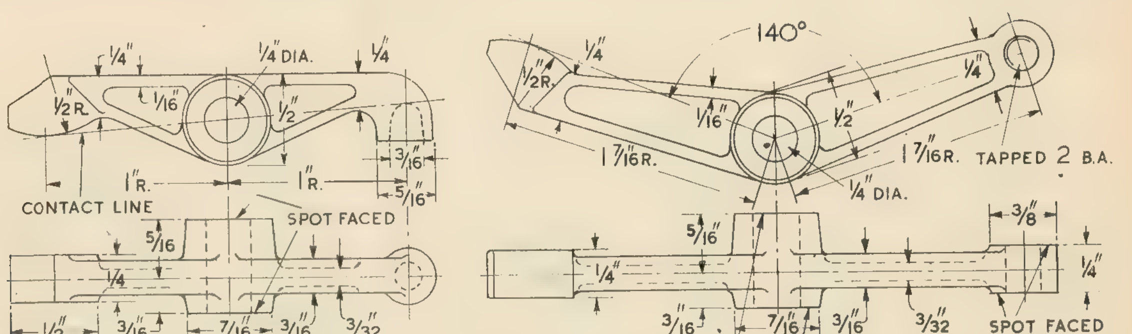
no matter whether the latter is held in the lathe and the cutter mounted on a milling spindle or the blank is held in a dividing attachment and the cutter driven by the lathe mandrel. In either case the cutter is adjusted to cut two tangential flats at $\frac{3}{8}$ in. radius on the blank, at the specified angles for the two respective cams, ment of appropriate angle) to check the contour.

The sub-angles produced by inching round the base circle can be smoothed off and the contour finished highly and accurately prior to case-hardening.

As the only part of the surface required to be hard is the actual cam track, the rest, and particularly the

The castings may be held by the centre boss for boring, reaming and facing the pivot hole; a cut is taken across the side of the contact finger, to true it up, at the same setting, after which the rockers are mounted on a pin mandrel for facing the other side.

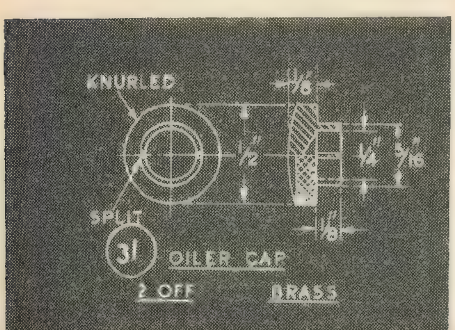
It will be noted that the exhaust



INLET ROCKER (15) 1 OFF EACH BRONZE EXHAUST ROCKER. (16)

and further cuts taken at the same setting to produce the base circle.

Whether the cams are filed or machined, the simplest and, indeed, almost the only practical way to produce the nose radius is by hand filing, using a radius gauge (this can be improvised by drilling a $\frac{1}{4}$ in. hole in sheet steel and cutting out a seg-



bore, may be protected from contact with the carburising powder by clamping the two cams together on a $\frac{1}{4}$ in. bolt, with a piece of steel tube over the bosses. Finally the tracks are polished with fine emerycloth, or better still, an India oilstone slip.

ROCKERS

The best material for the rockers, parts Nos 15 and 16, would be steel, as it would enable the contact tips to be hardened and thus made extremely durable, but machining them to a reasonably light section, while retaining adequate strength, would be a rather complicated operation. The alternative of employing a bronze casting is, however, quite satisfactory, and I have used cast rockers even on high-speed engines with heavy valve springs without trouble from excessive wear. Aluminium alloy rockers could be used if one is prepared to attach steel facings to the contact fingers.

rocker requires facing also at the roller end, and this can be done at the same time. The inlet rocker, on the other hand, has a fairly deep recess to take the rounded end of the push rod and this should be drilled, or at any rate finished, with a round-ended drill or D-bit. Note also that the drawing shows a centre line passing through the rocker axis and touching both the base of this recess and the contact face of the finger; this condition is essential to the geometry of the system, to reduce side thrust and sliding friction to the minimum, thereby promoting mechanical efficiency.

I may observe that neglect of the rules of simple geometry is often responsible for serious inefficiency of valve gear and many other mechanical motions—I have made many mistakes in this respect myself, but I have learned, by bitter experience, how to avoid most of them nowadays !

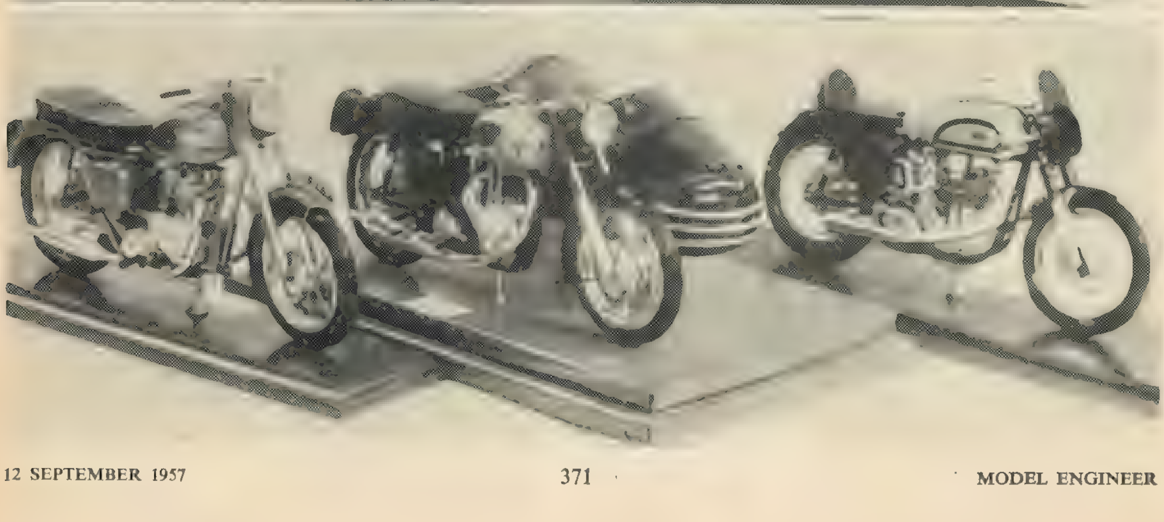
● *To be continued*

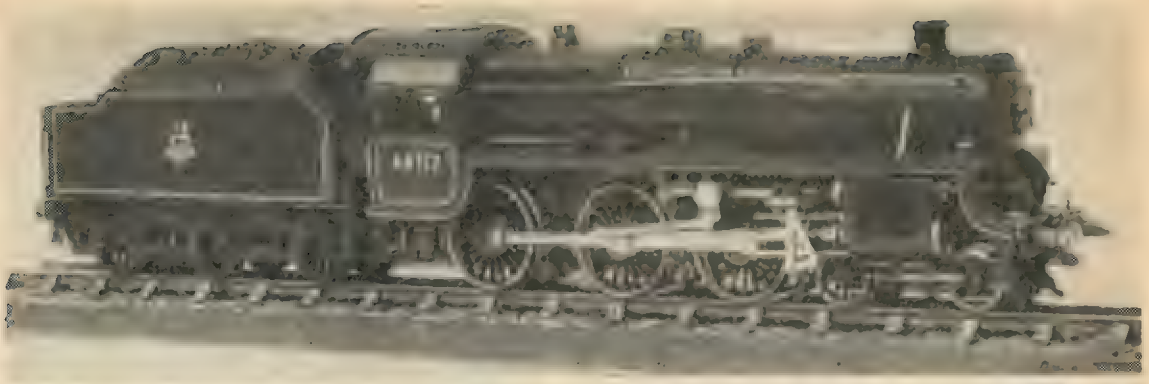
The ME Exhibition in pictures

A pictorial review of some models which won cups, medals and awards for their exhibitors

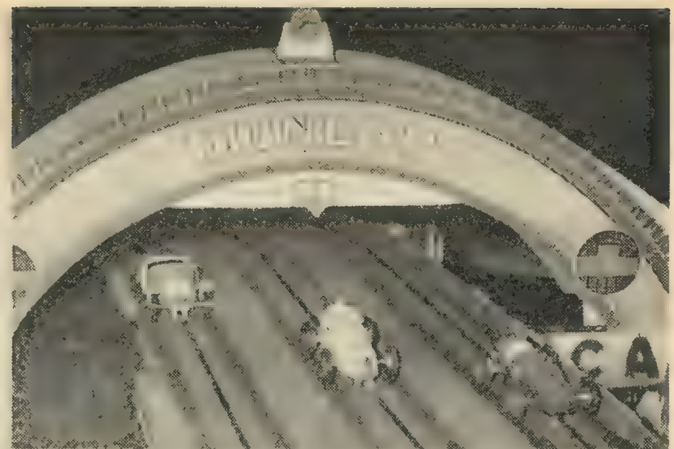
Alexander Vicherov with his model of the tanker MOSKBA *which won the class E Championship Cup and Silver Medal*

Below: Vicherov's championship model boat, and below it three model motor-cycles entered by H. W. Hooper, of Birmingham: A Norton 600 c.c. combination with Watsonian Monaco sidecar; a Triumph Thunderbird twin; and a Norton 1957 Manx racer



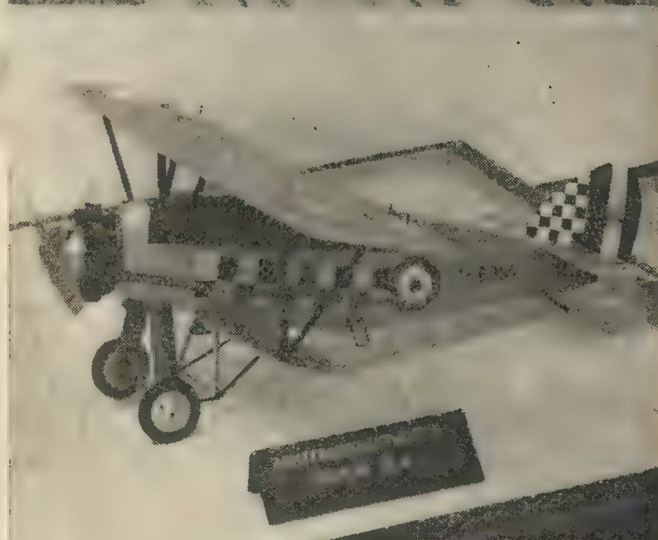



927



Opposite page: W. F. Gentry's LMS class 5 locomotive which won a VHC. Waterline model of the liner KENYA, *which won a bronze medal for D. A. S. Hughes. Schools class locomotive by C. T. Standfast was awarded a bronze medal. The championship cup in class F was won by this frigate,* LA LICORNE, *by F. A. A. Pariser*

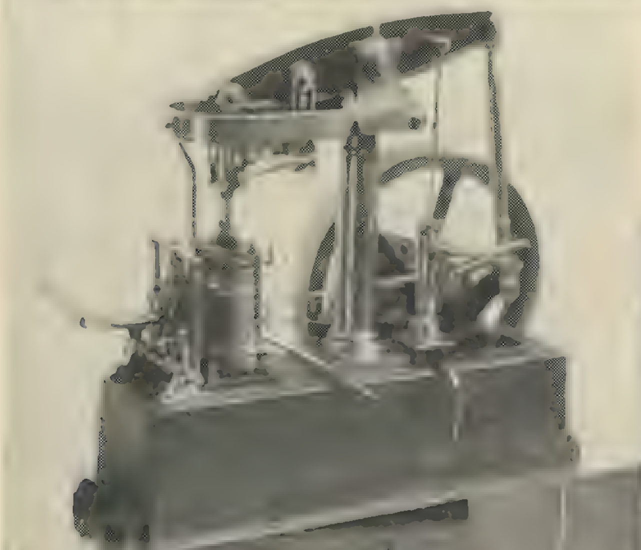
Above: Twin-cylinder air-cooled petrol engine, loaned by Cecil C. Brinton. Top, right: The NLSME track. Right: This model of an Armstrong-Whitworth Siskin 111*a by H. J. Randall, was very highly commended. Below, right: Silver medal and the Commander Dennison prize went to Chas Blazdell for this fine model of the seagoing tug* ENERGY. *Below: Deck removed to show triple expansion engine which powers* ENERGY

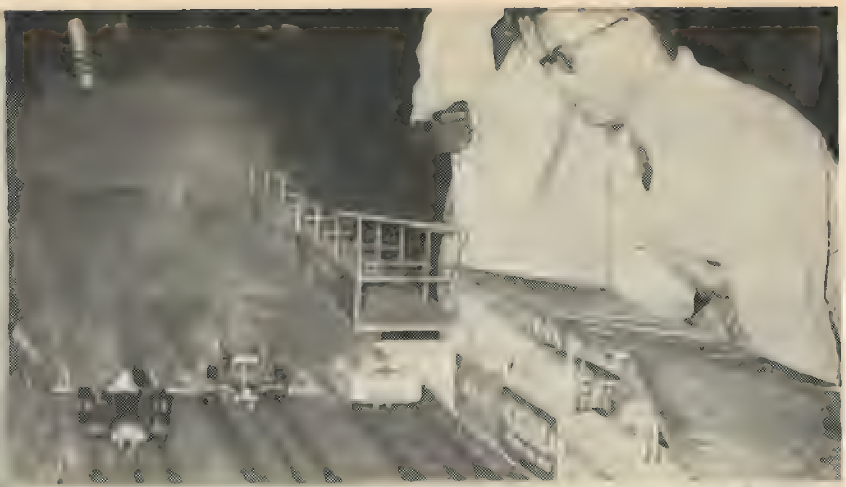


★

Left: *Would-be modellers? Miss Margaret Baudains and Miss Kathleen O'Neil find the marine section of absorbing interest. Left, centre*: *A Stuart Turner beam engine exbited by R. T. Martin. Left, bottom*: *Another view of Mr Blazdell's tug* ENERGY. *Below*: *The model car track. Right*: *Louis R. Raper won the championship cup and silver medal in class A with this model of an Aspinall 0-6-0 goods engine of 1889. It is built to the difficult scale of $1\frac{1}{16}$ in. to 1 ft*

★



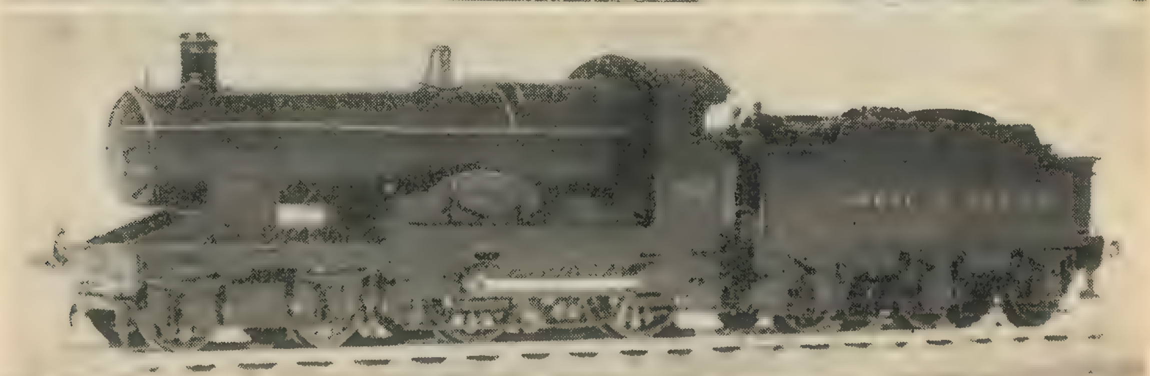


Right, top: Another view of the model car track. Right, centre: This road roller is powered by an internal combustion engine and won a VHC award for its constructor, W. T. Eridge. Right, below: H. F. Milne was awarded a VHC for this model of an 80-gun warship, third rate, of the early eighteenth century

★

Captions for pictures on page 376

Top: R. P. Holdstock's 3½ in. gauge Schools class locomotive which won a silver medal for its builder. Second from top: A. I. Dunbar's model LTSR third-class bogie coach was awarded a VHC diploma. Second from bottom. Also awarded a VHC was this electrically powered model of a GWR Bulldog class 4-4-0 locomotive built by G. H. Smith. Bottom: R. E. Lee's LMS 2-6-0 Mogul locomotive won him an HC diploma



ROSE

LBSC now tells you how to make and fit the motion work on this beginner's 2-4-0 engine

Continued from 22 August 1957, pages 270 to 272

SOME years ago I fixed up an old commercially-made tank engine with some new parts, among which were single round-section guide bars and L-shaped crossheads. They were used both for quickness and simplicity, and proved quite satisfactory so I have adopted the same kind of components for the job in hand.

The guide bar is a 2 in. length of $\frac{1}{8}$ in. round silver steel with $\frac{3}{16}$ in. of $\frac{1}{8}$ in. or 5 BA thread on one end. Hold the rod in the chuck and screw it with a die in the tail-stock holder so that the thread is true. When screwed into the tapped hole in the gland boss on the cylinder, it should be parallel with the piston-rod—and see that it is or you'll have trouble when erecting !

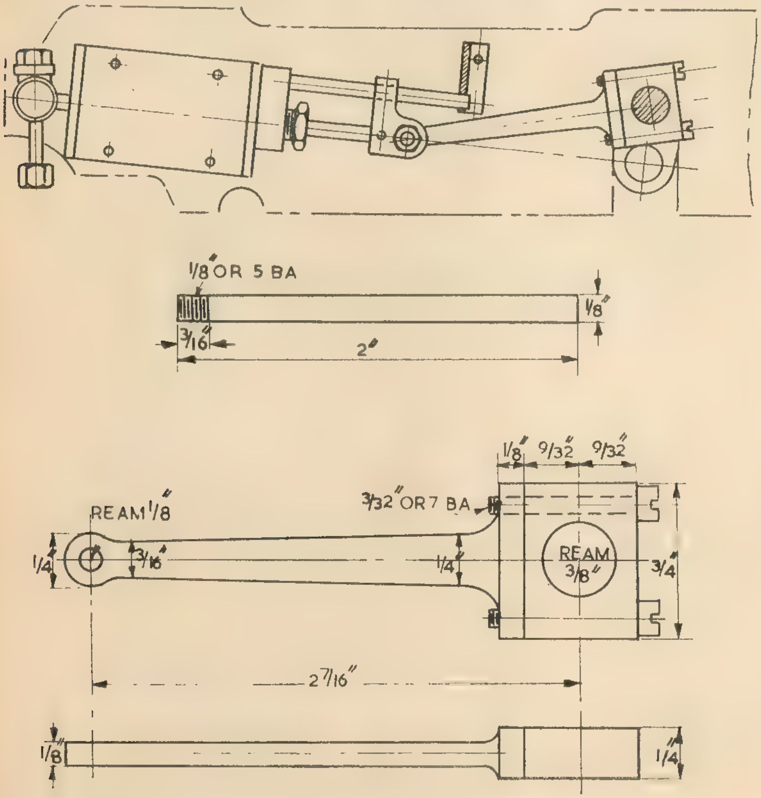
The motion bracket which supports the outer end of the guide bar is merely a piece of 16-gauge sheet steel $\frac{11}{16}$ in. wide, bent over at each end to fit nicely between the frames. That job can be done in the bench vice. At $\frac{5}{8}$ in. from the end and $\frac{1}{8}$ in. from the bottom, drill a No 30 hole for the end of the bar, but don't erect it yet.

The crosshead is made from a piece of $\frac{5}{16}$ in. × $\frac{5}{8}$ in. rod (brass or steel) about $\frac{7}{8}$ in. long. Scribe a line down the middle of one narrow side, make a centre pop on it at $\frac{3}{16}$ in. from the end and another at $\frac{7}{16}$ in. farther along.

The first is drilled No 23 for the piston rod and the other for the guide bar, using No 30 drill, and, as these two holes must be dead parallel, either use the drilling machine with the piece held in a machine vice or else chuck in the four-jaw with each pop mark running truly in turn and drill from the lathe tail-stock. The piston rod may be screwed into the crosshead if you prefer it; in that case drill both holes No 30 and tap the first one 5/32 in. × 40, screwing the end of the piston rod to suit.

Drill the hole for the crosshead pin No 32—that merchant must go through exactly at right angles to the other two—and ream it $\frac{1}{8}$ in. The crosshead can then be filed to outline. The slot for the end of the connecting-rod can be end-milled by clamping the crosshead on its side under the lathe toolholder, at centre height, and traversing it across a $\frac{1}{8}$ in. end-mill or slot drill in the chuck.

The crosshead pin, or wrist pin as it is sometimes called, is just a $\frac{5}{8}$ in. length of $\frac{1}{8}$ in. silver steel turned down and screwed at each end to the dimensions shown.



Arrangement of the motion; guide bar; connecting-rod

THE CONNECTING-ROD

The marine type of connecting-rod is about the easiest to make and fit, and is adjustable for wear. To make the brasses saw or part off two pieces of $\frac{1}{4}$ in. × $\frac{5}{16}$ in. (if not available use $\frac{5}{16}$ in. square) a full $\frac{3}{4}$ in. long. Put the two $\frac{1}{4}$ in. sides together and hold them thus with a toolmaker's cramp, then solder them.

Don't take the cramp off, but make a centre pop right in the middle of the joint. The cramp will prevent their coming apart while the pop mark is made. Then take off the cramp, chuck the piece in the four-jaw with the pop mark running truly, open it with a centre drill, drill through with $\frac{1}{8}$ in. drill, following up with 23/64 in. and finally reaming $\frac{3}{8}$ in.

If $\frac{5}{16}$ in. square material has been used, face off $\frac{1}{16}$ in. while still in the chuck to bring the thickness to $\frac{1}{4}$ in. Then rechuck the piece so that one end projects, and face that off truly, repeating the operation on the other end, then top and bottom, until the piece measures $\frac{9}{16}$ in. × $\frac{3}{4}$ in. with the reamed hole in the middle.

Scribe a line down the middle of the $\frac{3}{4}$ in. end, and at 3/32 in. from each end of the line make a centre pop. Chuck in the four-jaw with each of these running truly, and drill right through the thickness of the piece with a No 41 drill. These holes are for the screws.

There is no need to seek out a friendly blacksmith to forge the rod. Just saw off a piece of $\frac{1}{8}$ in. × $\frac{1}{4}$ in. mild steel $2\frac{3}{8}$ in. long, chuck truly in the four-jaw and turn a pip on the end $\frac{1}{16}$ in. dia. and a full $\frac{1}{8}$ in. long. Saw off another piece $\frac{7}{8}$ in. long and drill a $\frac{1}{16}$ in. hole in the middle.

Put the pip in the hole so that the

two pieces form a tee, and braze the joint; just smear with wet flux, heat to bright red and touch the joint with a bit of soft brass wire or a $\frac{1}{16}$ in. Sifbronze rod, letting the melted metal form a fillet. Quench in cold water and clean up.

Before filing to shape temporarily clamp the brasses to the head of the tee, and run a No 41 drill through the screwholes, making countersinks on the tee. Measure the distance from the centre of the reamed hole in the brasses to the location of the hole for the crosshead pin at the other end, and make a centre pop at that point. Drill it No 32 and ream $\frac{1}{8}$ in.

Take off the brasses, drill the countersinks in the tee-head No 48 and tap 3/32 in. or 7 BA. Mark out the shape of the rod, setting out the little-end boss around the hole for the crosshead pin, then file to shape.

Before parting the brasses make a mark on each (pop mark or figure) so that when parted they can always be put together again in the original way. Heat them until the solder melts, wipe off any surplus, then assemble the lot with two long screws as shown.

These can be home-made, turning them from 5/32 in. round steel, or they can be made from $\frac{7}{8}$ in. lengths of 3/32 in. silver steel with a few threads on each end. Screw one end into the tee, put on the brasses and secure them with commercial nuts.

THE ERECTION

Put the little-end of the connecting-rod in the slot in the crosshead and put the pin in. Push the crosshead over the guide bar and enter the piston rod in the hole in the crosshead. Take off the brasses, drop the whole assembly in place in the frames and temporarily fix the cylinder by putting a couple of screws at each side. Put the brasses over the crankpin and couple up.

Place the crank on back dead centre, with the piston rod fully extended. This will automatically line up the guide bar with the piston rod. Put the motion plate in position with the end of the guide bar going through the hole provided, and put a toolmaker's cramp at each end to hold the flanges tightly against the frame while the crosshead is adjusted to its exact position.

Turn the wheels until the piston rod is right home and the piston hits up against the front cylinder cover; the crank should then be on the front dead centre. Take off the cover and carefully drive the piston in 1/32 in. so that the rod will enter the crosshead by that much more.

If the piston rod is screwed into the crosshead make the adjustment by turning the rod. Then take out the whole bag of tricks, drill a No 53 hole through crosshead and piston rod, and squeeze in a little bit of $\frac{1}{16}$ in. silver steel to act as a cotter.

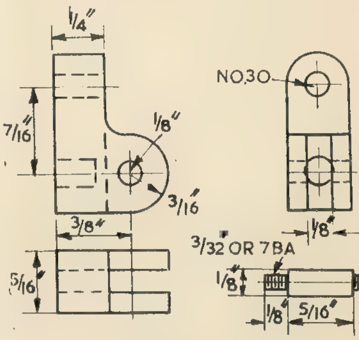
Replace the assembly, couple up the big-end and see if the wheels turn freely by hand, the crosshead sliding up and down the bar without any tight places. If all right, the motion plate can then be fixed either by drilling and tapping the flanges for the screws through the holes already in the frame, or by drilling clearing holes through the flanges with a No 41 drill and using screws nutted inside the frame.

ECCENTRIC-STRAP AND ROD

If the casting for the strap has any rough spots on it, clean it up with a file, then centre pop the side lugs or ears and drill them No 48. Make a couple of marks on one side—the same as the big-end—then grip the strap in the bench vice with half the lugs showing above the jaws and saw across with a fine-tooth hack-saw using the tops of the vice jaws to guide it.

Tap the holes in the stepped half 3/32 in. or 7 BA and open out the holes in the other half with a No 41 drill, smooth off any sawmarks and screw the halves together. Chuck in the four-jaw with the corehole running as truly as possible, face off the side and bore out the corehole to a nice running fit on the eccentric. For a gauge I always use a piece of rod turned to the same size as the eccentric. Face the other side on a stub mandrel.

The easiest way to slot the other lug for attaching the rod is to hold it in a machine vice (regular or improvised with bits of angle and screws) on the lathe saddle and traverse it under a 3/32 in. saw-type cutter on an arbor between centres.



Crosshead and pin

It can also be cut by hand with a little care, slotting first with a hack-saw and finishing with a keycutter's warding file.

The rod itself is a simple filing job, using $\frac{3}{8}$ in. × 3/32 in. steel strip or any offcut of sheet steel that might be handy. Drive it into the slot and

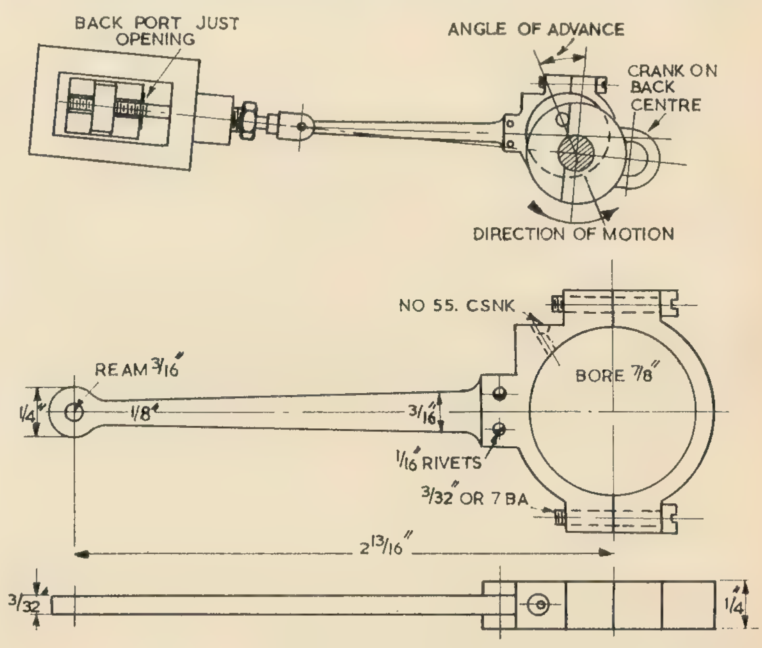


Diagram of the valve setting; eccentric strap and rod

solder it, putting two 1/16 in. rivets in for extra security. Put the strap over the eccentric and make sure it fits correctly, then proceed to set the valve.

VALVE SETTING

Take out the cylinder, remove the steam chest and replace cylinder with a couple of screws at the side to hold it in position. Prop up the chassis on its side with the port face of the cylinder upwards; I usually grip one of the beams in a small machine vice on the bench, which allows the wheels to be turned. Take the slide valve and spindle out of the steam chest and put the valve on the port face, coupling up just the same as shown in the illustration.

Tighten the screw in the stop collar, turn the wheels by hand and watch the valve movement; guide it in a straight line with a piece of wire or anything else handy. The ports should open an equal amount at each end of the movement; if they don't then adjust the nut by turning the spindle.

When you get equal openings put the crank in the postion shown in the diagram on back dead centre. Slacken the setscrew in the stop collar and turn it until the edge of the back port is showing at the end of the valve (see drawing).

Tighten the setscrew and turn the wheels in the direction of the arrow until the crank is on front dead centre. The edge of the front port should then be showing. If it isn't, the valve is a wee bit too long; take a little off *both* ends to keep the cavity in the middle, and have another shot.

When you get that bit satisfactory turn the wheels the other way. Watch the valve carefully; if the ports crack on the dead centres, the setting is all right for going either way. If, however, the port cracks *before* dead centre, the shoulder of the stop collar against which the stop pin is bearing needs a little filing off it.

Contrariwise if the port doesn't crack until *after* dead centre, the shoulder needs building up, which can be done by soldering a little piece of brass to it. When the ports crack on dead centre when the wheels are turned in either direction, the valve setting is correct.

Now note carefully: whatever else you may do *don't on any account alter the position of the nut on the slide-valve spindle when reassembling the whole works.* If you do you've had it.

What I usually do is to drill a small hole, say with a 60 drill, through the nut and spindle, and squeeze a bit of a domestic pin in it. That prevents the nut from moving accidentally, and when replacing the nut on the spindle after inserting it into the steam chest all there is to do is to turn the spindle until the holes in the spindle and nut coincide and you can push in the fragment of pin.

THE LUBRICATOR

All that remains to complete the working parts is a lubricator. The tank is a piece of ½ in. brass or copper tube about 22-gauge and 1¾ in. long. Square off the ends in the lathe. It should fit nicely between the angles holding the frame to the buffer beam; if the ends of the screws project through file them off.

Drill a ⅜ in. hole in the middle, and in it fit a ¼ in. × 40 bush for filling. Directly opposite drill a No 32 hole, and in that fit a ⅛ in. length of ⅛ in. tube with a few threads on one end. This is for draining out the condensate water. Fit a disc of 16-gauge copper in each end.

To make the nipple chuck a piece of 5/16 in. hexagon brass in the three-jaw, face the end and turn down ½ in. length to 5/32 in. dia. Part off at a full ¼ in. from the shoulder. Reverse in the chuck, turn down 5/32 in. length to 3/16 in. dia. and screw 3/16 in. × 40.

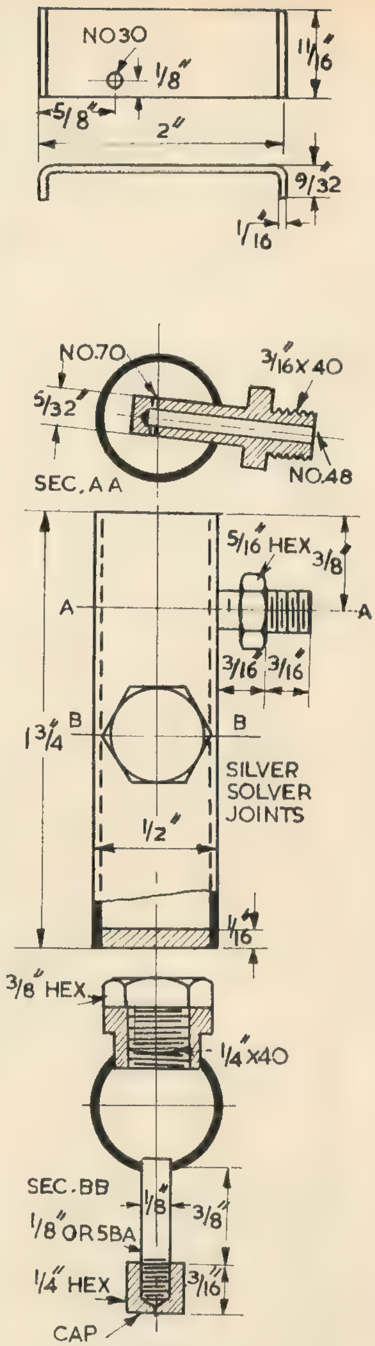
Centre and drill No 48 to 11/16 in. depth. At ⅛ in. from the blind end drill a No 70 hole into the central hole, as shown in the section. Next drill a No 22 hole in the tank at ⅜ in. from the right-hand end, and fit the nipple into it slightly on the slant, at the same angle as the cylinder in the frame. Make quite sure that the No 70 hole is at the top—very important that.

Now silver solder all the joints at one heating. Pickle, well wash and clean up, then screw the nipple into the tapped hole in the front end of the steamchest. When right home the tank should be horizontal, with the filler bush at the top and the drain pipe hanging vertically, as shown in the arrangement of the motion drawing.

The filling plug is turned from ⅜ in. hexagon brass rod and needs no detailing. The cap for the drain pipe is made from ¼ in. hexagon brass rod, in the same way as a union nut except that it has no thoroughfare hole in it.

The cylinder with all its attachments can now be permanently erected. The little-end of the eccentric rod should be attached to the fork on the valve spindle by a 3/32 in. or 7 BA screw with 5/32 in. of plain under the head; or the holes in the fork may be reamed 3/32 in. and a silver-steel pin fitted with nuts on both ends.

Avoid any slackness, as it upsets the valve setting, and be sure that the setscrew in the stop collar is well tightened up and not close enough to the eccentric to cause it to bind.



Lubricator and motion bracket

To test by air pressure, block up the beams so that the wheels are clear of the bench. See that the ⅛ in. pieces of packing are between the bottoms of the coupled axleboxes and the hornstays, so that the boxes

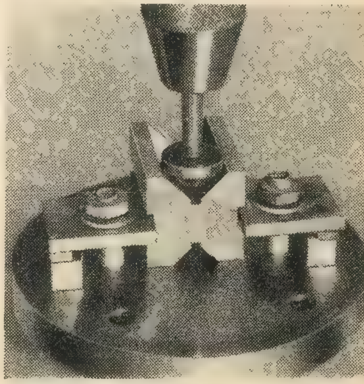
● *Continued on page* 383

A universal BALL-and-SOCKET HEAD *for a camera tripod*

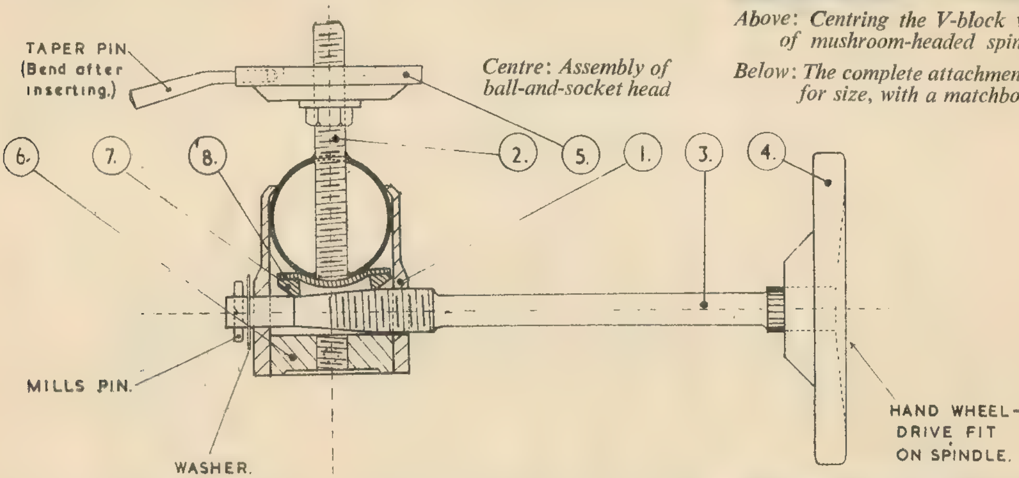
ERNEST L. LEE provides full details for this useful aid to good photography

IN common with other model engineers, I sometimes find that jobs come my way in batches of kindred types. For instance, some nine or ten ball joints have been constructed in recent months for various purposes.

Had some rough sketches been made at first, work might have been simplified, but very few practical men (including myself) seem to like paper work. The culmination was the making of a ball and socket for a tripod to support a quarter plate camera modified for photographing models. Then some sort of design scheme just had to be got out, and from this the drawings reproduced here were prepared.



Above: *Centring the V-block with use of mushroom-headed spindle*



Centre: *Assembly of ball-and-socket head*

There are plenty of swivelling accessories of various kinds for camera tripods on the market, but they are either too flimsy or too expensive for my modest pocket. A moderately costly one purchased by a friend was rather harsh in action. A ball and socket if used for the purpose proposed should, I submit, have the following characteristics:

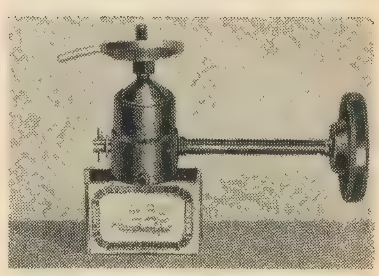
1 It must be strong and work smoothly.

2 The tightening screw must be adapted to apply pressure to the ball slowly, easily, and progressively, varying from practically no grip to dead tight. The adjustment must be very light to the touch throughout the whole range in order to obviate disturbance of the camera setting in close-up photography.

3 The control knob of the adjusting screw *must* stand well away from the camera and be sufficiently large to be "found" and handled without any trifling about while concentrating on focusing on a ground glass screen.

With the exception of the 1 in. dia. ball, all parts of the simple fitting were turned from bits and pieces from the scrap box. The ball was taken from an armchair castor, costing 2s. 4d. complete. Incidentally, such balls are usually hollow (the shell being about 5/64 in. thick); thus they are nice and light.

From the detail drawings it will be seen that there are eight main components, plus sundry washers, pins, etc. The assembly drawing shows the method adopted to obtain pressure on the ball by means of a tapered adjusting screw. As the latter is tightened, it exerts a gradually increasing pressure on the steel washer and domed fibre pad beneath the ball until, finally, the ball is frictionally locked between the pad and the annular ledge at the top of the bore of the socket. The finished article is



Below: *The complete attachment shown, for size, with a matchbox*

seen standing on a matchbox.

The machining is simple and needs no description—similar work having often been described in these pages before. One small operation is,

perhaps, a little out of ordinary, namely the doming of the fibre washer. This was done by the simple expedient of placing it centrally over a $\frac{9}{16}$ in. steel washer and pressing out a bulge with the ball (1 in. dia.) of a ball-pein hammer.

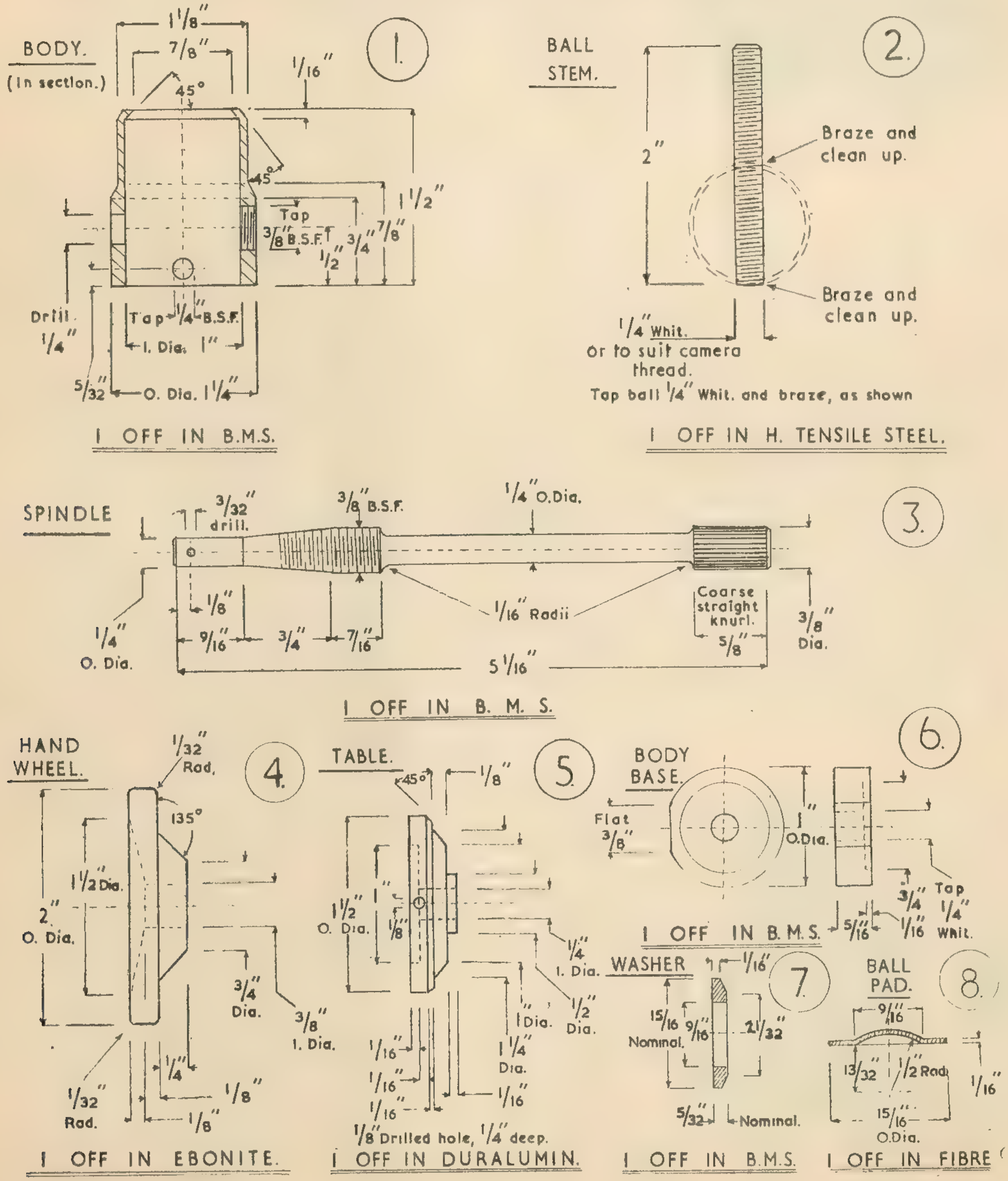
The hammer head, fibre disc and the washer were placed in line between vice jaws, and the vice closed on them sufficiently to press up the bulge into the hole in the washer. Copper vice jaw-grips were used to prevent damage, of course. The domed pad forms an excellent seating for the swivelling ball.

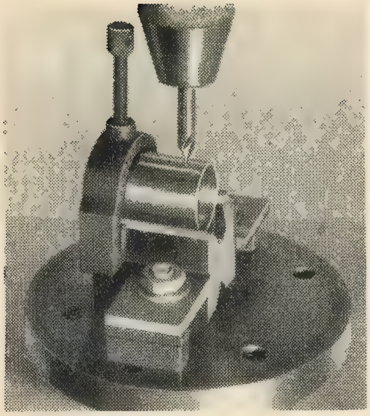
Further operations that might have given a little trouble were the drilling of reasonably accurate cross holes (socket body and spindle) and trepanning the 2 in. dia. control knob out of $\frac{1}{2}$ in. ebonite sheets. But as similar " ops " had been dealt with so often before, the necessary small aids were immediately available to defeat snags before they arose.

As these aids have application in home engineering practice, it is proposed to describe them, but before doing so, just a few words about assembling the ball and socket.

The $\frac{1}{4}$ in. Whitworth threaded member (part No 2) was made from the

PARTS for UNIVERSAL BALL and SOCKET HEAD for a CAMERA TRIPOD.





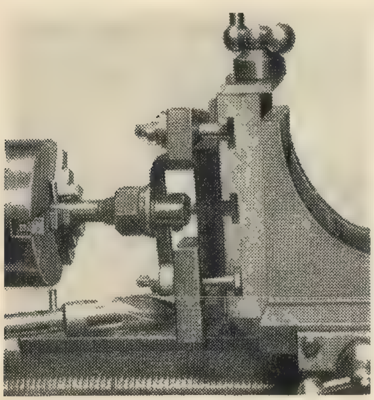
Method of accurately drilling cross holes by use of V-block

shank of a high tensile steel bolt and silver soldered into the ball, then both were cleaned up. The thickness of the steel washer beneath the fibre pad is critical and must be just right.

In the present instance it was made too thick and then the back was faced off to suit (by trial and error) while putting the device together. Before final assembly, all the working parts were well coated with graphite. Dag is an excellent lubricant for this type of job—once the surplus has disappeared there is no mess.

Further, as the $\frac{3}{8}$ in. BSF thread is turned off to form a taper on part No 3 traces of the thread grooves are left on the spindle, these form a good lodging place for graphite, so lubrication between this fairly highly stressed part and the steel washer (part No 7) is more or less continuous.

When completed, the fitment was given a coat of matt (camera) black to prevent rusting.



The set-up for trepanning

METHOD OF DRILLING CROSS HOLES IN ROUND STOCK

A fairly accurate way of drilling cross holes without a precision jig to guide the drill is to centre a V-block under the spindle of the drilling machine and provide means to prevent the drill from wandering. To accomplish this—with the drilling machine stationary—a V-block may be quickly and accurately placed by utilising a mushroom-headed spindle, having a 45 deg. (90 deg. inclusive) angle turned on its head. The spindle and its head must be concentric (see drawing).

The stem of the spindle is inserted in the drill chuck, with the conical head downwards, and the chuck tightened. The cone is brought into contact with the V of the block and the latter held firmly on the drill table by means of the feed lever. While thus held the block is anchored to the table. The mushroom-headed spindle can now be removed from the chuck, and the round stock should be well centre-popped at the point where the cross hole is required.

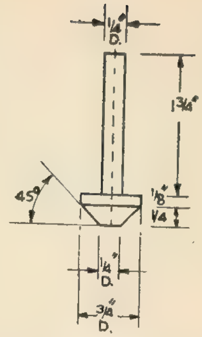
After securing a centre drill of suitable size in the drill chuck, the round stock is placed in the V of the block, the point of the centre drill brought down into the pop mark and the stock located and held in position in the block by gentle but firm pressure on the feed lever. With the stock so held, it is secured firmly by a V-block clamp or, if a special clamp is not available, by any other suitable clamping medium.

All now being rigid, the drilling machine may be started at its highest speed and a good countersunk depression cut in the round stock with the centre drill. The diameter of the countersink should not be greater than the diameter of the cross hole required.

The final action is to remove the centre drill, insert a twist drill of correct size in the chuck and drill through the round stock—the drill will not wander. The workpiece in the picture is similar to the body of the ball and socket joint which was cross drilled before the smaller outer diameter was turned.

If the cross hole is so large that there is risk of damaging the V-block with the drill point in breaking through, there is no difficulty in arranging that the part of the workpiece to be drilled shall overlap and clear the holding block, provided one possesses two V-blocks of the same size—they are usually acquired in pairs.

In this case place the two V-blocks on a flat surface fairly close together, mount a mandrel (a short length of bright steel stock will serve) in the two Vs, and secure it to each with



Mushroom-head spindle for centring V-blocks under drilling machine chucks

V-block clamps, leaving just enough free land on the V of one block to accept the head of the mushroom spindle. With this latter block positioned and held in the drilling machine table by the mushroom-headed spindle, fix the other one to the table with the mandrel still in place, then remove the mandrel from the V-blocks. One block will now be free.

Proceed as before but place the free V-block under the driller spindle and with the workpiece resting evenly in the Vs of both blocks, locate and hold the centre popped workpiece with the centre drill. When thus properly centred, clamp the workpiece in the fixed V-block.

Start the hole with the centre drill as described and afterwards use a twist drill of correct size. Before the drill breaks through, remove the free V-block by sliding it from under the workpiece—if necessary slightly slacken the block clamp on the fixed V-clamp then re-tighten and continue with the drilling operation gently, with the end of the workpiece unsupported.

A word of caution: always start the cross hole with a centre drill—a twist drill will certainly " run off " the pop mark. The centre drill shown in the picture is a Morse No 5—$\frac{1}{4}$ in. dia. body with 5/64 in. tip.

The same effect may be attained with a V-drill-pad in the tail-stock of a lathe. The pad, of course, requires no centring; it is already centred. But if the workpiece be clamped with a toolmaker's cramp to the pad (which should preferably be a largish one) the drilled cross hole (after the remainder of the instructions relating to centre popping and the centre drill have been carried out) will be of a very fair order of accuracy.

The method outlined does not pretend to be as precise as jig drilling, but it has been found satisfactory for

● *Continued on page* 390

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Stainless-steel axles

I am building LBSC's *Speedy*. The axles are of stainless steel, but since fitting them I have been told this material is unsuited to plain bearings. Can you tell me whether or not this is the case?—H.M., Cefn, Denbighshire.

▲ *If the stainless steel which you have used for the axles of your* SPEEDY *is of a good free cutting quality it is quite suitable for use in plain bearings. However, it is absolutely essential to make sure that all the bearings are properly lubricated, even if they are made of bronze. In addition, the axles should run perfectly freely in the bearings. If these points are carefully provided for you should have no trouble.*

Destroyer modelling

I wish to construct a scale model of a Daring or Battle class destroyer. I should be grateful if you could tell me where I might obtain a detailed plan of one of these.—A.W., Wembley, Middx.

▲ *You could get an excellent detailed plan of a Battle class destroyer, to the scale of* $\frac{1}{8}$ *in. to* 1 *ft, from Norman A. Ough,* 98 *Charing Cross Road, London, WC*2. *The drawing, which is of HMS* CADIZ, *was reproduced with pictures in* "*Ships and Ship Models*" *for September* 1954.

A sectionalised drawing of a Daring class destroyer by Laurence Dunn, again with illustrations, was published in "*Ships and Ship Models*" *for April* 1954, *but this was not a scale drawing.*

Suitable gauge

I am proposing to erect an elevated continuous track with straights of 50 ft and maximum curves of 14 ft radius. What gauge should I lay for passenger-carrying and which of LBSC's locomotives would be most suitable for it?—J.W.W., Bexleyheath, Kent.

▲ *With curves of* 14 *ft radius it should be possible to run quite successfully a* $3\frac{1}{2}$ *in. gauge* 0-4-0 *tank engine such as* JULIET. *This gauge is the smallest on which* 14 *ft radius curves are really safe for passenger-carrying, but the short radius will make it impossible for you to use a six-coupled engine of any length. If, however, you would prefer a six-coupled wheeler then* P. V. BAKER, *a* $3\frac{1}{2}$ *in. gauge* 0-6-0 *side tank engine, would just manage it comfortably so long as the flanges were removed from the middle wheels.*

Loco building

I would appreciate information on the following questions:

1 In assembling locomotive cylinder covers and valve chamber on to a cylinder and valve cover is it necessary to use a gasket to make the assembled parts steam tight?

2 What is the radius of curvature for the angle joining the flange and tread on locomotive wheels in $3\frac{1}{2}$ in., 5 in. and $7\frac{1}{4}$ in. gauge?

3 What is tread angle, if any, for locomotive wheels in the above listed gauges.

4 The minimum track radius for *Tich.*

5 A comparison or listing of American and British wire gauges, etc.

6 In brazing copper boilers with an oxygen acetylene torch, must the whole boiler be preheated prior to brazing to prevent expansion and contraction stresses?

7 Which would be preferable for $7\frac{1}{4}$ in. gauge locomotive building: a vertical or a horizontal milling machine?—W.F.W., Miami Beach, Florida.

▲ 1 *There is no absolute necessity to use a gasket when assembling the valve chest and valve covers. A good close fit plus a thin coating of plumber's jointing should do the trick.*

2 *There is no definite decision as to the radius of curvature for locomotive wheels between the flange and the tread provided that a radius is definitely there. The chief point is that the inside face of the flange should preferably slope away from the rail head to a slight extent as this tends to overcome the tendency for the wheels to bind on a curve.*

3 *The standard angle for the slope of the tread is three deg. or* 1 *in* 20.

4 *The absolute minimum radius that* TICH *would negotiate is* 12 *ft.*

5 *A comparison of British and American wire gauges, etc., can be found in any good mechanical engineer's notebook, one of which is published by E. and F. Spon, of New York.*

6 *When brazing copper boilers the whole boiler should be pre-heated prior to brazing.*

7 *A vertical milling machine is the better for model locomotive building.*

Copper wire

Some time ago I purchased from a London firm some enamelled copper wire. I now require a further supply, but unfortunately I have lost the address of this company. I should, therefore, appreciate it if you can put me in touch with a supplier.—K.H., Barnoldswick, Lancs.

▲ *You can obtain all sizes and varieties of electrical instalment wires from the London Electric Wire Company and Smiths Ltd.* (*Lewcos*). 24 *Queen Anne's Gate, Westminster, London, S.W.*1. *If you write to this address they will probably let you have information about a local stockist.*

ROSE By LBSC

Continued from page 379

are in running position. Screw a piece of $\frac{3}{16}$ in. pipe into the tapped hole in the steam chest and connect a motor-tyre pump to it; I use old tyre valves for adapters, the outer ends being turned down and screwed to suit whatever size of pipe needed.

Turn the wheels in a forward direction until the crank is just past dead centre; then, if the pump is operated gently, the wheels should turn evenly and smoothly, with sharp beats from the exhaust hole in the cylinder. Next turn the wheels backwards, to the same position as the crank, and the result should be the same. If the pump is vigorously operated, the wheels should spin like a buzz-saw and the exhaust should sound like a miniature machine-gun.

As the lubricator won't work when the engine is operated by air (steam condenses in it and the resulting water lifts the oil to the outlet) it is advisable before attaching the tyre pump to squirt a few drops of oil—motor engine oil will do for this—into the steam chest. But don't put your head over the exhaust outlet when you start pumping! Next stage will be the boiler.

● *To be continued*

RESULTS OF THE ME EXHIBITION

The class and competition winners and the names of those who received commendations

DUKE OF EDINBURGH CHALLENGE TROPHY

A. W. G. Tucker (Bramhall)—90 h.p. triple expansion single cylinder launch engine.

CREBBIN MEMORIAL CUP

Louis R. Raper (Manchester)—Scale model of 0-6-0 Aspinall goods locomotive.

AVELING AND BARFORD TROPHY

E. Hinchliffe (Rochdale)—Single-crank Burrell compound traction engine.

STUDENTS' CUP

Cup and Silver Medal: **R. Riley** (Clapham)—Anemometer.

Bronze Medals: **D. Holt** (Hampton)—Planimeter; **Roger Shapland** (Kingsbury)—Stuart 10 with boiler.

VHC: **D. Nash** (Southall); **John Dennys** (Bayswater).

HC: **Robert Potts** (Kingsbury); **Alan Marro** (Kingsbury); **Colin Tieche** (Kingsbury).

CLASS A

Championship Cup and Silver Medal: **Louis R. Raper** (Manchester)—0-6-0 goods locomotive.

Silver Medal: **R. P. Holdstock** (St Leonards-on-Sea)—3½ in. gauge locomotive.

Bronze Medal: **F. F. Few** (Hatfield)—3½ in. gauge 0-4-2 *Lion*.

VHC: **Kenneth Dean** (Brentwood); **J. H. Hatherley** (Sheffield).

HC: **Kenneth J. Webber** (Cheddar); **R. E. Lee** (Enfield); **M. Vest** (Chester-le-Street).

C: **M. V. Street** (Weston-super-Mare); **D. B. L. Collins** (Bristol).

CLASS B

VHC: **G. H. Smith** (Ruislip); **W. F. Gentry** (Bristol).

CLASS BA

Bronze Medal: **C. T. Standfast** (Ilford)—Schools Class locomotive.

VHC: **Geoffrey Balfour** (East Grinstead); **L. A. Hoffman** (London, E6).

HC: **W. D. Hough** (Purley).

C: **Leslie H. Brown** (London, NW10).

CLASS CA

Bronze Medal: **Bernard Wright** (New Malden)—GWR van, SR van, and SC coal wagon.

VHC: **A. I. Dunbar** (Upminster); **D. E. H. Birse** (Ilford).

Model Railway News Prize: **A. I. Dunbar** (Upminster)—LTSR third class coach.

CLASS D

VHC: **Djalal Yusupov** (Sebastopol); **Nikolai Kaminski** (Odessa); **Djalal Yusupov** (Sebastopol).

HC: **E. Maynard** (Hove); **A. T. Bartlett** (London, N1); **Djalal Yusupov** (Sebastopol).

C: **J. L. Hamilton-Paterson** (Edgware).

CLASS E

Championship Cup and Silver Medal: **Alexander Vicherov** (Nikolaev)—Tanker *Mockba*.

Silver Medal and Willis Cup: **William Morss** (London, N15)—Cabin cruiser *Edie*.

Silver Medal and Commander Dennison Prize: **Chas Blazdell** (Norton)—Seagoing steam tug *Energy*.

Bronze Medal: **W. A. Bagshaw** (London, NW1)—Steam cabin cruiser *Magpie*.

VHC: **C. G. Wheeler** (London, N13); **B. P. Webb** (London, N19); **W. A. Brewer** (London, SE10); **A. R. Falconer** (London, SE13).

HC: **W. J. Carter** (Northwood Hills).

C: **F. E. Nicholson** (Great Yarmouth); **Mr Marks** (Ealing); **B. P. Webb** (London, N19).

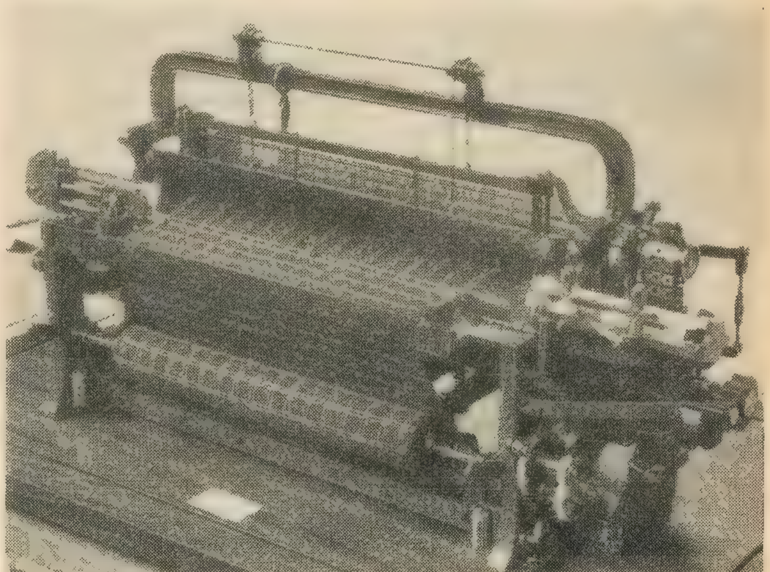
CLASS F

Championship Cup: **F. A. A. Pariser** (Kidderminster)—Frigate *La Licorne*.

Silver Medal and H. V. Evans Trophy: **A. E. Field** (Streetly)—Severn trows of late 18th century.

VHC: **D. B. Sanglier** (Birmingham); **Capt. J. W. Moroney** (Wembley); **H. F. Milne** (London, SE25).

HC: **L. Gough** (London, SE13).



T. W. Millward, of Manchester, modified his model of an underpick tappet loom with a drop-box two-shuttle motion to weave a cross check pattern

CLASS G

Silver Medal: **C. J. Buckman** (Welling)—10 rater yacht *Laughing Water*.

VHC: **G. W. Fitzgerald** (London, SW12); **R. C. MacCormac** (London, SW19).

HC: **J. Hardy** (Kings Langley).

CLASS I

Championship Cup: **Capt. J. Thomson**—*Salamis*.

Silver Medal: **R. Carpenter** (Brighton)—MV *Eskbank* and motor torpedo boat.

Bronze Medal: **D. A. S. Hughes** (London, SW3)—Waterline model of BI liner *Kenya*; **A. S. Randall** (London, SE20)—Grimsby trawler *Leda*; **Arkadii Ushakov**—Atom-powered icebreaker *Lenin*.

VHC and Maze Cup: **J. Hardy** (Kings Langley).

VHC and Sawer Prize: **Mikhail Chernakov** (Leningrad).

VHC and Commander Dennison Prize of 2 gns: **Sergei Uriev** (Leningrad).

VHC and MODEL ENGINEER Prize: **D. Hunnisett** (Eastbourne).

VHC: **J. T. King** (London); **C. C. Beazley** (London, N1); **R. L. Hornsby** (London, N21); **C. Seston** (London, W7); **E. C. Freeston** (Greenford); **Alexander Vicherov** (Nikolaev).

HC: **M. J. Hards** (Southport); **H. Chauvaux** (London, SW1); **J. F. Salter** (London, NW6); **Major S. W. Barton** (Luton); **A. C. A. Keevil** (Warlingham); **E. Baynes Rock** (Bexhill).

C: **B. G. Phillips** (Slough); **G. MacKay Smith** (Castle Douglas); **C. Seston** (London, W7); **D. Hunnisett** (Eastbourne); **A. J. Lench** (Wembley); **J. J. P. Feasey** (Slough).

CLASS J

Championship Cup and Silver Medal: **T. W. Millward** (Manchester)—Modified Dobcross underpick tappet loom.

Silver Medal: **W. R. Coombe** (Hayle)—Roller feed perforating press.

Bronze Medal: **K. N. Harris** (Rustington)—Horizontal condensing engine.

VHC: **H. M. Webb** (Filton).

HC: **L. J. King** (Bristol); **J. A. Elliott** (Dagenham).

CLASS K

Silver Medal and Westbury Prize: **G. Noble** (Bristol)—30 c.c. petrol engine.

Bronze Medal: **Dr C. R. F. Hewlett** (King's Lynn)—Supercharged 15 c.c. split single i.c. engine.

HC: **S. E. Hutson** (Bexley).

CLASS L

Bronze Medal: **E. Hinchliffe** (Rochdale)—Burrell light Devonshire engine.

VHC and C. B. Reeve Prize: **W. T. Eridge** (Staines).

HC: **Leslie Tatlock** (Kearsley).

CLASS M

VHC: **L. Kirby** (Wembley).

C: **R. S. Brown** (Wimbledon).

CLASS N

Silver Medal and Bowyer-Lowe Cup: **J. A. Pickles** (Colne)—Ornamental turning apparatus.

Bronze Medal: **P. Wookey** (Harlow New Town)—Watchmaker's lathe.

VHC: **K. D. Wayte** (Harefield); **Russell W. Mason** (Clevedon); **D. P. A. Gibson** (Ruislip); **R. J. Perry** (Harlow).

HC: **Mervyn Vest** (Chester-le-Street); **Mervyn Vest** (Chester-le-Street); **P. Wookey** (Harlow); **P. Try** (Frimley); **Russell W. Mason** (Clevedon); **W. Richmond** (Newcastle upon Tyne); **W. T. Eridge** (Staines).

CLASS O

Bronze Medal: **S. A. Walter** (Wembley Park)—9.2 in. BL gun.

VHC: **H. F. Spurr** (Birmingham).

CLASS P

Silver Medal: **J. Given** (Sunningdale)—Cathedral.

Bronze Medal: **B. C. W. Windle** (Wargrave)—River Close, Wargrave.

VHC: **Lt-Cdr T. F. Richards** (Watford).

HC: **I. D. Grant** (Wimbledon).

CLASS Q

Silver Medal and Bradbury-Winter Cup: **F. J. Newcombe** (Bristol)—35 mm. camera.

Silver Medal: **A. E. Bowyer-Lowe** (Letchworth)—Shortt free pendulum clock.

Bronze Medal: **J. C. Stevens** (Ealing)—Model of the Duplex escapement.

CLASS R

VHC: **Sir W. Guy Fison** (Salisbury).

HC: **R. A. Holder** (Worthing).

CLASS S

Bronze Medal: **Paul M. Harris** (Nailsea)—Stuart beam engine.

VHC and Exide and Drydex Cup: **John Dennys** (Bayswater); **A. E. Hames** (Northampton).

HC: **Adrian Bomback** (North Harrow); **Adrian Bomback** (North Harrow); **R. A. Carr** (Surbiton); **Clive J. Hoskins** (Par); **John Paxton** (Morden Park); **E. Tedaldi** (Hucclecote).

CLASS AA

Bronze Medal: **J. O'Donnell** (Salford)—Transient.

HC: **A. Roginsky** (London, N4).

CLASS AB

Model Aircraft Prize and Silver Medal: **B. I. Fry** (London, SE2)—*Wendy*, finished in air observation post colours.

VHC: **M. A. Shepherd** (Ashford); **J. O'Donnell** (Salford).

HC: **C. E. Read** (Newport Pagnell).

C: **W. R. Stobart** (Northampton).

CLASS AC

Bronze Medal: **C. Hollowood** (Nantwich)—Twin engined *Venture I*.

VHC: **D. Draper** (Ickenham).

HC: **F. O. Probert** (Ebbw Vale).

C: **R. H. Pilling** (Prestwick).

CLASS AE

Silver Medal: **H. J. Randall** (Brighton)—RE8 of No 3 Squadron, Australian Flying Corps 1918.

Bronze Medal and Bristol Cup: **Dr F. J. Morley** (London, SW3)—Bristol *Braemar II* of 1918.

Bronze Medal: **H. J. Randall** (Brighton)—Avro 504K trainer of 1918.

VHC: **H. J. Randall** (Brighton); **Dr F. J. Morley** (London, SW3); **John Wardman** (Otley).

HC: **J. Wardman** (Otley).

CLASS AF

Championship Cup and Silver Medal: **E. H. Norman** (Colerne)—*Arrow Active* Mk II.

Bronze Medal: **R. A. Chivrall** (London, SE23)—SE5 with 42 in. wing span.

VHC: **D. Morrey** (Crewe).

C: **W. T. Wilstead** (Ebbw Vale); **M. A. A. Beckett** (Crewe).

CLASS AG

Bronze Medal: **E. and J. R. Mead** (Chelmsford)—*Junior* 60.

HC: **N. Allen** (London, NW11).

CLASS AH

Bronze Medal: **J. Williams** (London, N5)—Avro Lancaster Mk III.

VHC: **E. Wigley** (London, SE24).

HC: **R. Barron** (Southampton).

C: **Stephen Blay** (Edgware).

CLUB TEAM TROPHY

Birmingham Ship Model Society.

ME SHIP MODEL SOCIETIES CHALLENGE TROPHY

Wembley Ship Model Society.

THE WORKSHOP SHAPING MACHINE

By DUPLEX

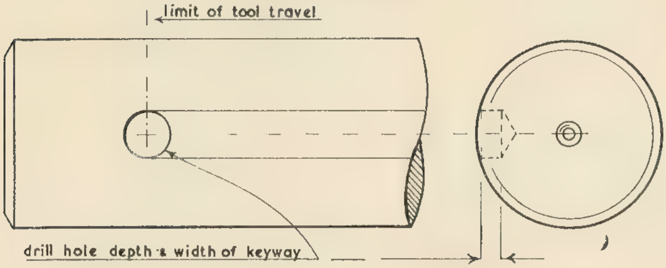


Fig. 25: Preparing the work for cutting a blind keyway

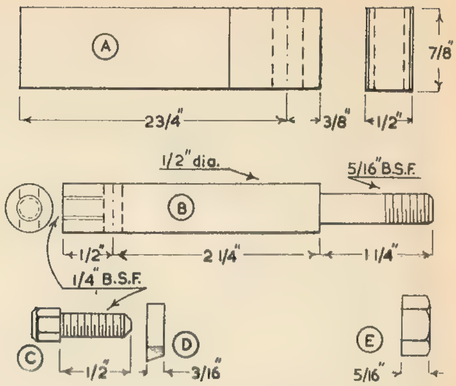


Fig. 22: The keyway-cutting tool. A *the tool shank;* B *the tool bar;* C *the clamping screw;* D *the tool bit; and* E *the bar securing nut*

THE second tool depicted in Fig. 19 [September 5] was specially made for machining internal keyways in the bore of pulleys and gear wheels.

The tool shank *A* is machined to fit in the shaper toolpost and is cross-drilled to receive the tool bar *B*, which is first cross-drilled with a $\frac{3}{16}$ in. drill and afterwards opened out with a square broach to accommodate tool bits of the corresponding size.

Broaching operations, similar in principle to the commercial process, can be easily carried out in the small workshop with home-made tools and, as this is a not an unusual requirement, a description will, it is hoped, be given in a future article of the methods employed in making and using broaches suitable for this kind of work.

Keyway-forming tools of this type usually cut more freely when drawn rather than pushed through the work. This can be put into practice by reversing the tool bit in the holder and, after the clamping screw has been securely tightened, the clapper box is locked by employing one of the methods previously described to enable light cuts to be taken on what is normally the idle stroke of the shaping machine.

This tool can also be used for internal shaping when forming slots with either tapering or parallel sides.

For this purpose, as illustrated in Fig. 23, the work is first marked out and a drill hole is formed on the centre line at either end of the slot so that the surplus metal can be removed with the hacksaw. If the edges of the material have been filed parallel, the work is rested on a parallel packing piece and gripped in the machine vice to enable the slot to be correctly aligned when the work is turned over for machining the opposite surface.

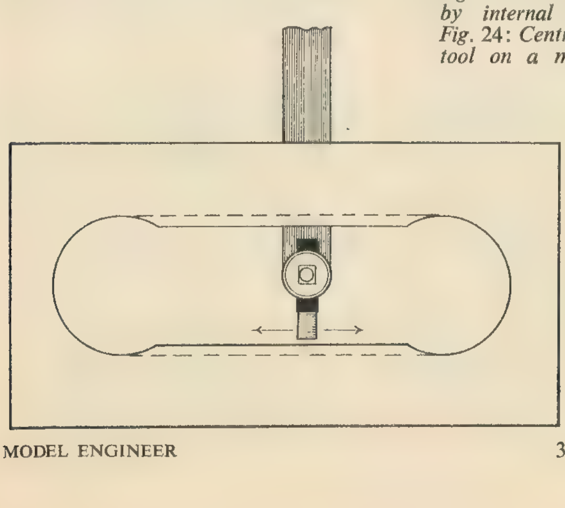
Where the slot has tapering sides, the work should be set up by aligning the scribed dimension lines with the upper surface of the vice jaws.

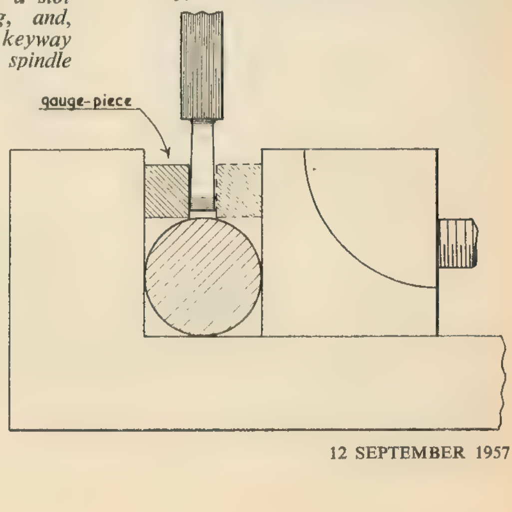
MACHINING SHAFT KEYWAYS

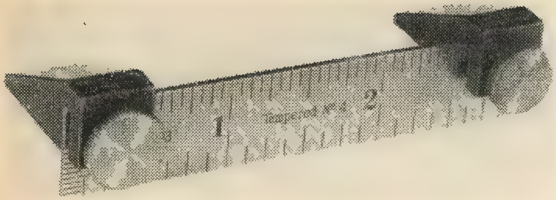
Although blind keyways in machine spindles are commonly formed by a milling operation, they can also be readily cut in the shaping machine by adopting the following method of machining. A tool suitable for this work is illustrated in Fig. 24; this is similar to a lathe parting tool having a cutting edge equal in width to that of the keyway; but the top rake given to provide free cutting must not be excessive or the tool may tend to dig into the work and spoil the finish. Moreover, chatter may develop when using a wide tool if the shaping machine lacks rigidity.

To enable the keyway to be formed with a blind end, as shown in Fig. 25, a recess in which the tool can finish the cut is machined by drilling a radial hole of a diameter equal to the width of the finished keyway. In this way, with the exercise of a little care,

Fig. 23: Machining a slot by internal shaping, and, Fig. 24: Centring the keyway tool on a machine spindle

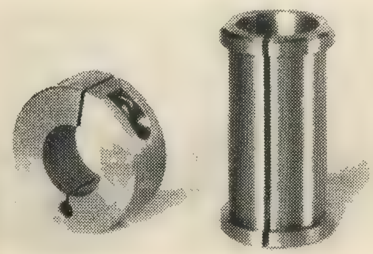






Left, Fig. 26: Rule clamps for marking-out keyways

Below, Fig. 28: Examples of work slit by the use of the hack-saw tool



a neat keyway with a rounded end can be machined.

As it is important to cut the keyway exactly on the diameter line of the spindle, a dependable method, such as is shown in Fig. 24, should be adopted for centring the tool on the work.

With the spindle gripped in the machine vice, the tool is lowered to within a short distance of the work surface and is then centred by using a piece of rod or the shank of a twist drill as a distance gauge. For example, where the diameter of the spindle is, say, $\frac{1}{2}$ in. and the width of the keyway $\frac{1}{8}$ in., a $\frac{3}{16}$ in. dia. rod will serve this purpose.

When setting the ram travel, the cutting stroke should finish with the tool exactly on the diameter line of the service hole drilled in the spindle.

An alternative way of setting out the keyway and aligning the tool on the work is to start by marking-out the dimensions of the keyway by using a rule held in guide clamps of the pattern illustrated in Fig. 26. The scribed dimension lines must be projected on to the end face of the spindle so that they can be set vertically with the aid of a square resting on the machine table.

A HACK-SAW TOOL

It is not always an easy matter to cut a long, straight slit accurately with a hand hack-saw in a sleeve or other metal part and, because this kind of work cannot always be carried out in the machine hack-saw, the tool shown in Fig. 27 was designed for slitting collets and collars in the shaping machine.

The two work pieces illustrated in Fig. 28 show that this tool does this work satisfactorily.

The toolholder was originally made for holding the small $\frac{5}{16}$ in. dia. boring bar illustrated; but, since the end of the holder was slit with a hack-saw blade similar to that used for making the cutting tool, the short blade is securely held when the two clamping screws are tightened.

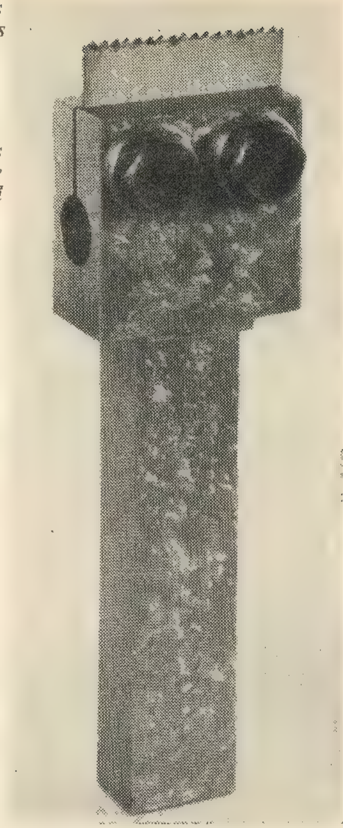
To keep the shortened hack-saw blade from shifting in the holder two curved notches are ground in the upper edge of the blade to butt against the clamping screws.

As shown in the drawing, one notch is ground more deeply than the other. This is for the purpose of slightly tilting the blade upwards at the forward end so that the leading edge will engage the work without shock at the start of each cutting stroke.

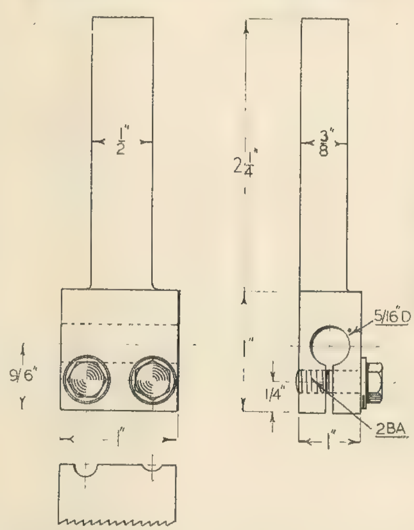
In practice the stroke of the ram is set to carry the tool clear of the work on the cutting stroke and the clapper box is left free to rise on the return stroke to prevent the tool rubbing. The tool cuts freely and there is no danger of breakage as would be the case were a narrow parting tool used.

High-speed steel hack-saw blades are fitted since they are more resistant to wear and the teeth are stronger than those of the carbon-steel variety. Blades of the former kind are easily cut to the required length by using a narrow, abrasive, cutting-off wheel designed for this purpose.

Any attempt to shorten the blades by bending them in the vice will result in splintering and the formation of an irregular break.



Above, Fig. 27: A slitting tool fitted with a hack-saw blade

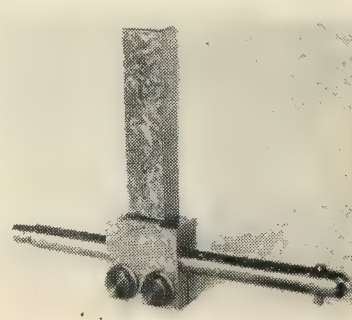


Left, Fig. 29: The dimensions of the hack-saw tool

Below, Fig. 30: The toolholder fitted with a keyway tool

When the small boring bar illustrated in Fig. 30 is mounted in the holder, it can be used in the lathe or shaping machine for cutting internal keyways in gear wheels and other shaft fittings having bores of $\frac{3}{8}$ in. dia. or more.

● *To be continued*



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

FOUNDRYWORK

SIR,—I have just received a copy of B. Terry Aspin's book *Foundrywork for the Amateur*. I would most certainly advise all model engineers who have not experienced the joy of making their own castings to obtain this book.

Mr Aspin writes in the language of the layman and uses many easily understood diagrams. Another good point, which is not often found in this type of book, is the list of manufacturers at the back headed, " Where do I get it ? "

RAF, Schleswigland. P. J. RICHARDS.

BALLAST PACKER

SIR,—I was most interested in reading Mr Whitehall's letter [Postbag, August 8] about the Matiza ballast clearer, for only recently I came across a Matiza ballast packer at work on the main line from Perth to Inverness. Actual location was 15 miles north of Perth, where the line runs through Birnam Woods, the same woods that were so fatal to Mr Macbeth.

My Matiza was quite a small Lady, and was busily and noisily employed packing the ballast under the sleepers. This she did by plunging two little spade-shaped pistons into the ballast, and then agitating them violently for about ten seconds.

This action was simultaneously performed on port and starboard. Then she moved forward one sleeper and repeated the operation.

My Matiza, though small, was somewhat superior, for she was self-propelled, and controlled by one elderly gentleman who seemed to be enjoying his Sunday paper while working two levers and a clutch pedal.

She was attended by a small retinue of men carrying spades and pickaxes, but either she was such an efficient little lady or the day was too hot for work, for neither spades nor picks seemed to be required.

The gent in the bowler hat, of whom I made inquiry, told me that the machine was called Matiza and was made in this country under licence from a Swiss firm, and that she did the work of thirty men in half the time and at small cost to British Railways and the fortunate taxpayer.

R. N. LOCHHEAD.

Ballast packing Matiza which is claimed to do the work of 30 *men*

LAKE STEAMERS

SIR,—Regarding the Windermere steamer [Postbag, August 22] the engines on the *Tern* are horizontal, twin cylinders and are under the boiler, which is a locomotive type with firebox forward.

Being twin screw, the port engine has its cylinders on the starboard side of the centre line of the ship, while the starboard engine's cylinders are on the port side. This makes a very compact engine room.

They look like two pairs of locomotive engines with shortened connecting-rods and large balance weights on the cranks which have been moved through a right angle. I used to travel on this steamer to and from school in 1911.

The most interesting engines I have seen on a lake steamer were those on the *Gondola* on Coniston Lake. The steamer was a single screw with locomotive type boiler and firebox forward, fired on the port side. The shaft was under the boiler but the two cylinders were one on each side, set diagonally with one crank with large balance weights and one eccentric. An interesting design for a model.

The *Gondola* was sold as a houseboat in 1947 and can be seen at anchor near Water Park at the South End of the lake. She was built by Kennedy and Co., of Liverpool, in 1859 as the private steam yacht for the Duke of Devonshire and was later taken over by the Furness Railway, LMS, etc.

I wonder if any drawings of her have been preserved as she was a most graceful and striking ship.

Grasscroft, Nr Oldham, Lancs. R. C. ROBERTS.

CHANGING CHARACTER

SIR,—What on earth is happening to the Model Engineer Exhibition ?

I am sorry to be so blunt, but have just returned from my usual visit which has merely confirmed my earlier suspicions: that the entire character of the show has changed, not only from what it was before the war, but during the post-war years.

The old, intimate atmosphere of the Horticultural Hall in Vincent Square has gone. It used to be a quiet event, where amateur craftsmen of all kinds could meet and inspect each other's work—and *buy things* !

Let me explain this last point by saying that recently I have become the very proud owner of a brand-new Myford lathe, and I journeyed to the Exhibition fully intending to purchase a number of small accessories. At the Myford stand, I was politely but regretfully informed that no lathe accessories were available there !

In years gone by there have been stands by Tyzack, Buck and Ryan, Bond's o' Euston Road, Gray and

others as well, all fairly loaded with lathe accessories. And they all did a roaring trade in small tools of every description. Can you please tell me why this is no longer the case?

Perhaps there are staff difficulties, or things in short supply, or other difficulties which the organisers have to face. I do not know, but I would be interested to hear other people's impressions of this year's show. All I know is that round the hall were a large number of stands selling (or trying to sell) things sometimes only remotely connected with model engineering and mechanical things generally.

The actual models, in the competition and loan sections were, I thought, well up to standard, in variety and workmanship, but I would like to see

at future exhibitions more tools and materials for immediate sale, and also more club stands filled with member's work—and staffed by *enthusiasts*!

Chelmsford, Essex. J. H. BERRY.

Nobody regrets the absence from the ME Exhibition of some of the firms mentioned by our correspondent more than the organisers. They have all been invited to take part but one way and another they have been unable to do so.

August is a trying month because of staff holidays but from our point of view it is not easy to change the date of the Exhibition. There are several factors which make a change of date difficult, not least of which is the availability of suitable halls at dates which are acceptable in other directions.

Model engineers generally, I think, are sorry that their old and trusted trade friends are not represented at the Exhibition but obviously the firms concerned give the matter careful consideration before they decline the invitation. I hope that in future years the position will be improved.—EDITOR.

THE GIL EANNES

SIR,—A long term builder of scale model ships, I came across a very interesting ship, called the *Gil Eannes*, from Portugal.

I wrote to the company who own and run this ship, seeking information in which to build a scale model of her, and I am delighted to say my letter bore much fruit.

I received splendid drawings, giving plan and elevation of the exterior of the vessel, full colour charts, photographs, and a full description of her duties for which she was built, thus enabling me to prepare scale drawings at $\frac{3}{16}$ in. to the ft, for a 5 ft model.

The *Gil Eannes* was built in 1955 by the Estaleiras Navias de Viana do Castelo for Gremio dos Armadores de Navias da Pesca do Bacalhau, to replace the former famous ship *Gil Eannes*, held in great affection as the "mother" ship of the Portuguese cod fishing fleet on both the Greenland and Newfoundland fishing banks.

The new *Gil Eannes* will provide amenities for the Portuguese fishermen who live the hard life on those banks in the schooner fishing fleet.

As mother ship her duties to the fishing fleet are many. She will carry a chaplain, doctors, nurses and also means of communication by wireless and mail with home.

She is fully equipped, with operating theatre, X-ray equipment, hospital and convalescent wards, all being in a very modern design and furnishings.

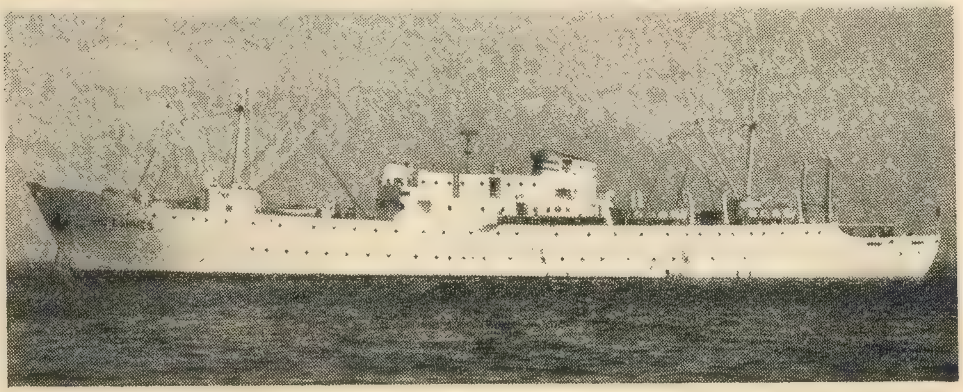
She is also equipped with towing gear, salvage equipment, and workshops to repair damage suffered by the fishing fleet while at sea.

The principal particulars of the *Gil Eannes* are as follow: 3,467 tons, length 232 ft, 45 ft beam, and 18 ft draught. Her propelling machinery are two Fairbank Morse eight-cylinder two-cycle diesel engines, developing 1,400 b.h.p. at 300 r.p.m., giving her a speed at 13 knots.

Notable features on this ship's superstructure are the recessed doors, tapered squat funnel and moulded sloping bridge, the stern being unusual on this ship, with towing hook and rope guides, similar to a tug's stern. The fore part of the ship, from bridge to stern, resembles a modern freighter. The ship actually carries six heavy duty winches, eight derricks with two king posts, and yet her lines give her the appearance of a yacht.

The colours of the *Gil Eannes* are white with blue top booting. The funnel is white with two blue bands and the red cross emblem on the shield.

After study and arrangement of drawings for the model, I find it will be quite an easy matter to construct the hull in metal or on the bread-and-butter principal. The superstructure I shall make in 20 s.w.g. brass sheet.



The modern "mother" ship of Portuguese cod fishing fleet, the GIL EANNES, *successor to its earlier namesake pictured above*

The colour scheme, and size of the model, should give a very impressive appearance on the lake.

Wilmslow, Cheshire. W. E. BARNES.

THE D CLASS LOCOS

SIR,—I have read J. N. Maskelyne's very interesting article on the SECR D class engines ["Locomotives I Have Known," August 22] and there is one point on which I would like to comment, not with any idea of putting J.N.M. right, but just that it may interest him.

He states that in 1901 ten (Nos 726 to 735) came from Sharp Stewarts, five (Nos 741 to 745) from Stephenson

and five (Nos 736 to 740) from Ashford.

But Nos 741-745 were built at Darlington in the then new works of R.S. and Co. and I actually helped to build them ! The last one left Darlington early in 1903; I was a pupil in the erecting shop at the time.

I have always considered them as near perfect in proportions, but I don't think Wainwright had very much to do with their design—more likely it was R. R. Surtees, a good locomotive man of the Kirtley school, and, of course, the influence of Urie and MacIntosh just at that period. Urie especially.

At this year's Model Engineer Exhibition I saw a ¾ in. scale superheated paddlebox in the steaming bay of the SMEE. I was under the impression that, when these engines got their expanded smokeboxes and superheater, the paddleboxes were taken off and high running boards put on. I have seen some of them like this, but no doubt the modeller made his engine just as he saw it. Funny, because these " boxes " caused hot axleboxes by keeping the cold air off.

I think the last of these engines were withdrawn three or four years ago. They were eventually made into very good engines.

Tankerton, Kent. J. TAYLOR.

J.N.M. writes: The information that I gave about the building of these engines is as given in contemporary magazines, and by at least two other writers since. Therefore, I am more than interested in Mr Taylor's comment.

As to the design, this was, of course, due to the drawing office staff, as usual, and not necessarily to the chief personally.

The model " paddlebox " mentioned represents these engines as superheated by R. W. Urie in 1915-18. It was Maunsell who altered the splashers and running boards in 1930, when he also replaced the Urie superheater by one of his own design and fitted the engines with force-feed lubrication.—EDITOR.

IT'S THE ROAST BEEF . . .

SIR,—So Mr Buist [Postbag, August 15] criticises Mr Foster's bench micrometer. I suggest he reads Vulcan's Smoke Ring " Lights under bushels " in the same issue as his letter.

Articles such as Mr Foster's have helped the model engineer and the movement in general to become what they are today.

The two thou ? I expect Mr Foster can allow for this when working.

Wellington, Somerset. K. E. GRINTER.

BALL-AND-SOCKET HEAD

. . . . . Continued from page 382

most ordinary jobs and infinitely better than sighting by eye alone—which, to say the least, is chancy. A split pin or other cross hole that has " run off " makes one's work look very amateurish, in the worst sense of the word.

PREVENTING SLIPPING

The use of large round shanked tools—such as trepanning cutters—in small lathe chucks is not to be recommended. If no precaution is taken, the tool shank is pretty sure to slip round, damaging the chuck jaws, or the jaws become over-strained because the chuck has to be tightened too much.

In point of fact, all drills over ⅜ in. dia. and other rotary, parallel, round-shanked cutting tools in my kit, used in the 3½ in. self-centring chuck on an EW lathe, have cross holes drilled through their butts into which a short length of steel rod is light driven. One end of this is allowed to protrude (about ⅛ in.), to prevent the tool from slipping back into the hole in the centre of the chuck body; the other end does not extend beyond the surface of the tool shank.

The diameter of the pin naturally varies with the size of the shank. As will be seen from the picture the pin takes the drive from a jaw of the chuck. If the tool snags up, no slip occurs between the tool shank and the chuck jaws. All that happens on a light lathe is that the belt slips, and no damage is done to the chuck.

No shank has yet been found that is too hard to drill, though some of them are a bit tough.

It may be said, with some truth, that it is a lazy man who trepans a 2 in. dia. ebonite disc when he could rough it out with a hack-saw. I never use a hand tool if a machine tool can do the job without harm arising—and there must be many others of my mature age who feel and act in the same way.

The ebonite hand wheel for the ball-and-socket camera accessory was trepanned out of ½ in. sheet in about six minutes, using a tungsten carbide-tipped cutting tool. With a light feed the belt did not slip, and the tool shank was but lightly gripped in the chuck.

The set-up for this is shown in the picture in which a ⅞ in. dia. drill (with ½ in. round shank) is also seen. This is regularly used without damage to the lathe or its equipment.

My tripod head has been in use for some time—and it is continuing to give satisfactory service.

SCHEDULE OF SUNDRY FINISHED PARTS REQUIRED

One off 1 in. dia. ball from a chair castor.

One off ¼ in. Whit. nut, small type.

One off ½ in. washer, thin type.

One off ¼ in. BSF grub screw, ¼ in. long (Allen).

One off ⅛ in. (small end) taper pin, 1 in. long.

One off 3/32 in. Mills (or split) pin. ▣

CLOCK YEARS AHEAD . . .

Continued from page 366

Although, as in the Eureka clock, there is a contact pin on the balance wheel and a spring contact on the watch frame for carrying current to the electromagnet, the complex divided contact pin necessary for the slow Eureka movement is avoided, and a simple make and break action takes place. The closing of the contacts and moving of the index are in one direction of balance motion only.

The battery used is a 1.5 v. Leclanche dry cell the size of a small button; specially developed for this watch. It is made with highly purified and accurately proportioned ingredients. The case is gold plated to avoid bad contact due to oxidation. A run of one year at least is guaranteed with this cell.

Without battery, and at rest, the watch contacts are closed, so it is automatically self-starting as soon as a battery is inserted. Provision for disconnecting this battery, if it is desired to conserve power when the watch is not in use, is embodied in what, in a normal watch, would be the winding stem. This also can be used to adjust both the minute and second hands to start the watch " on the dot " to a time signal.

The outstanding feature of the Hamilton electric watch is its extreme simplicity. Reliability is ensured by the developments of special alloys for the various vital parts. Those competent to express an opinion on it say " it has come to stay."

There has been a world wide striving for many years to get in first with an electric wristwatch. Both Germany and France have produced models that have been under test for a long time but America must be declared the winner of production on a commercial scale. ▣

CLUB NEWS

EDITED BY THE CLUBMAN

YEAR by year, visitors to the Model Engineer Exhibition enjoy a Sunday trip to the headquarters of Malden and District SME on the Surrey edge of London. There are many who stay with the Exhibition for its whole run of eleven days, and for them the gala day at Malden, after the first hectic Saturday, provides a much-appreciated break in a setting where they feel entirely at home.

This year the society's 7¼ in. track was operating with some particularly interesting locomotives at work, among them a 1½ in. scale Great Northern Atlantic and, in the same scale, a Great Western 1000 class.

In many parts of Britain and in countries overseas you will find modellers who remember with pleasure their show-tide Sunday at Malden.

DAY AT ASTOLAT

Another run into Surrey takes us to Guildford. The ancient name of this town, whose guildhall will soon be four centuries old, was Astolat, and this Tennysonian identity will be borne by the 5 in. *Ajax* which the members of **Guildford MES** are hoping to finish, as a combined effort, for their annual exhibition on September 21.

The Guildford men believe, quite rightly, that a show needs all the movement that can be put into it. Neighbouring societies are kindly helping to make the wheels go round and the Guildford wives are playing their own invaluable part to ensure that everyone has enough to eat as well as enough to look at.

If you are a stranger to Astolat ask for the cattle market. The show is being held near there at St Saviour's Hall from 9.30 in the morning to the same hour at night.

IN MEMORIAM

Old friends who attend the Guildford event will feel the loss of Tom Hodgkiss and at the same time will be glad to know that the society is honouring this esteemed member by a memorial trophy in the members' competition.

In Sussex the **Lewes and District MEC** has suffered a severe blow in the sudden death of William Hebblethwaite, its secretary. Mr Hebblethwaite, a retired civil engineer, was a fine craftsman who brought his skill to modelling and was especially interested in the larger miniature railway gauges.

Gordon Webb, who takes his place as secretary, may be found at Flat 5 Wallands House, 34 King Henry's Road, Lewes. The club, which meets from 7.30 p.m. every alternate Friday, is building a OO gauge railway at Southover Grange. There is no lack of keenness but the membership needs to be larger.

WALK RIGHT INSIDE!

All being well, **Northolt MRC** will come before the public in rather a special way when it holds its annual exhibition on September 14. The show is at Northolt Village Community Centre (from 2 p.m. to 8 p.m.) and the O gauge railway will run, if possible, in front of the main building.

This is an excellent way of attracting the public. In Cardiff last year the South Wales and Monmouthshire Federation (hosts this year at the conference on the last day of the Model Engineer Exhibition) flew some first-class model aircraft over the City Hall, thereby catching the eye and interest of every passer-by.

Guests invited to Northolt include the Talyllyn RPS, Festiniog RS, Southall RC, and Orpington, West Wickham and Norwood railway clubs. They will see, among much else, Northolt's large stud contact system and the two-rail layout. As usual, there are light refreshments.

FOUND AT LAST

From what I hear, the city of York, which has a famous railway museum, is unable to provide a really suitable hall where the local model engineers can put on an annual show.

For five years **York City and District SME** has been without the kind of place that it needed for a public exhibition—a place which could be booked at a reasonable price and where the passenger railway could be run. I gather from secretary W. Shearman (28 Terry Street, York) that the authorities were rather nervous about the decorations.

Fortunately, the news is now better. York City and District SME will have an exhibition this year, from October 2 to October 5. It opens at 3 p.m. on the Wednesday, Thursday and Friday, and at 10 a.m. on the Saturday. The doors close at 9 p.m. on each day.

I am assuming that there *are* doors. Mr Shearman has forgotten to mention where precisely the show is being held.

AN ESSEX SHOW

You may have read recently of how **Brentwood and District MES** is making happy progress despite its rate difficulties. What the society is doing was well suggested to the local public at a handicrafts exhibition held by Brentwood Round Table.

Ken Dean's *Petrolea*, beautifully modelled to ¾ in. scale, is described to me by chairman Harold H. Robinson as "one of the loveliest things in 3½ in. gauge which I have ever seen—ME Exhibition prizewinners included."

Pictured with it here on August 22 was Les Powell's 5 in. gauge *Rainhill*, Ken Dean's launch engine and boiler, and, at the back, a 3½ in. gauge *Maisie* which R. A. Duke and H. E. Richardson are bringing to completion.

Ernest Ashton's big horizontal mill engine was running under compressed air, and Jim Westlake's four-cylinder ¾ in. scale Duchess chassis, another fine piece of work, was shown with his *Seal* petrol engine. The 1¾ in. gauge layout operated by Michael Binks and Peter Westlake took up most of the stand.

Altogether this was an excellent display; and it would have been still better if many of the members were not away at Bury St Edmunds.

ME DIARY

September 13 Birmingham SMS, "The Panama Canal," Capt. F. J. Marsden.
September 14 Huddersfield SME club invitation weekend (September 14 and 15).
SMEE informal meeting. Please bring something. Visitors invited. Pepys House, 14 Rochester Row, Westminster.
Birmingham SME Boy Scouts Day, Campbell Green.
Northolt MRC annual exhibition, Northolt Village Community Centre, 2-8 p.m.
September 15 MPBA Blackheath regatta, Cleary Cup.
Birmingham SME Members' Social Day, Campbell Green.
Worcester and District MES public running day, Diglis, 11 a.m.
North London SMEE Open Day, Rowley Lane, Arkley, Herts, 11 a.m.
Blackheath MPBC regatta.
REC Gloucestershire rail-tour.
September 18 Birmingham SMEE at White Horse: winter programme opens.
IEE Radio and Telecommunication Section's visit to Holland (Sept. 18-22).
September 20 Rochdale SMEE general meeting, Lea Hall, 7.30 p.m.
September 23 Teeside SMEE exhibition, Town Hall, Middlesbrough (week's show).

The picture of Britain's "oldest industrial engine" on page 354 last week was taken by Neville Fields, of 24 Etchells Road, Cheadle, Cheshire.

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

CLASSIFIED ADVERTISEMENTS

★ Private: 3d. per word. Trade: 6d. per word. Minimum 12 words. Use of box 1s. 0d. extra.
★ Rates for displayed advertising in this section. Trade 35s., Staff 45s. per single column inch. Column width $1\frac{5}{8}$ in.)

The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

£30 Latest Zyto $3\frac{3}{8}$" motorised on stand, fully equipped. Wanted ML7 or Super 7, cash.—2, Isabella Road, Homerton, London, E.9.

Capacity Available. Turning, light machining, fabrication of small parts, etc. Write—COOMBS, 115, West End Road, Southall, Middlesex.

Jigsaw. Table 8" × 6", throat $8\frac{1}{2}$". Uses Eclipse Junior or coping saw, 3-speed countershaft, £5 10s. Photo.—Box No. 8613, MODEL ENGINEER Offices.

Unused 0-2" M. & W. Micrometer. Set (four vols.) Newnes "Complete Engineer," data sheets and workshop calculations. What offers. Wanted $\frac{1}{4}$" sensitive bench drill.—8, Rivacre Brow, Ellesmere Port, Cheshire.

Wanted. Plain Precision Bench Lathe $2\frac{1}{2}$" to 4" centres. Particulars to—MOORE, 11, Gordon Terrace, Southbourne, Emsworth, Hants.

$4\frac{1}{2}$" Relmac Lathe, motorised, accessories, £25. 6" Barnes lathe chucks, faceplate, £10. Hand shaper, £5. Hand press, £1. Loco chassis "O", $3\frac{1}{2}$", $7\frac{1}{4}$" gauges. Model Engineers 1924 to 1957. Offers.—105, Reservoir Road, Erdington, Birmingham.

5" 5XP Wheel Castings, 50s. 5" and 3" s.c. chucks. Offers.—WARNES, 61, Elm Street, Hollingwood, Chesterfield.

Myford ML4 Lathe, complete with stand $\frac{1}{4}$ h.p. motor, chucks, drills, reamers, taps and dies. Partly finished $3\frac{1}{2}$" loco L.M.S. "Doris." Model Engineers Vols. 94-110, £40 or nearest offer. Write—MATHER, 7, Railway Street, Scout Hill, Dewsbury.

For Sale. Myford ML7 Lathe on cabinet with accessories, £45. Pool bench miller, £20. 5" hand shaper, £8. No. 1 fly press, 30s. All in good condition.—18, Humberstone Road, Tyburn, Birmingham, 24.

U.S.A. Porter Cable BK 10" Speedmatic portable saw. 1" × 10" blade, 2" × 9" blades, 2" × 9" carb. discs. Strong steel carrying case. Under one hour's use, £25. —Box No. 8618, MODEL ENGINEER Offices.

12" Circular Saw Spindle, dustproof ballbearings, pulley, flanges, unused, 62s. 6d. C.P.—Box No. 8619, MODEL ENGINEER Offices.

Wimet Tipped Lathe Tools. Sets of 12 in $\frac{1}{4}$", $\frac{5}{16}$" and $\frac{3}{8}$" square, price £2 15s. per set, $\frac{1}{2}$" square £3 5s. Cash or C.O.D. from—CORBETT'S (LATHES), Stanton Hill, Sutton-in-Ashfield. Used lathe list 1s.

E. Thurston, Boilermaker, successor of Mr. T. Goodhand, offers for sale the following new boilers: 7" × 14" multitubular, £8 13s. 7" × 14" centre flue, £7 10s. 9" × 18" centre flue, £9 18s. 12" × 30 centre flue, £21. All enquiries to—83, Pagitt Street, Chatham.

ML7 Lathe, Chucks, worth £75. 5XP "Olympiade" unfinished. Any offers.—GUBBINS, Bley Avenue, East Leake, Loughborough.

Watch Lathe by Watch Tool Co., with 8 mm. collets. This superb machine, one of the finest obtainable is as new, scarcely used, open to any inspection and guaranteed. Cost £50, accept £18, reason, the usual one, hard up. Seen London.—Box No. 8625, MODEL ENGINEER Offices.

Complete B.O.C. Welding Equipment, as new, £14. New Stuart Turner No. 10 water pump, £7 5s. $\frac{1}{4}$ h.p. Hoover, 240/1/50, 1,425 r.p.m., motor cap. start, £5. 50 volt, 11 amp generator, 1,400 r.p.m., £5. Stamp. —Box 8626, MODEL ENGINEER Offices.

MODELS AND FITTINGS

Traction Engine Wanted, model to 3". Write airmail to—ORLANDS CORNELL, Sidney, New York.

Wanted. 5" Gauge Truck (or parts).—WOODWARD, Fairfield, Old Hall Avenue, Littleover, Derby.

$7\frac{1}{4}$" Gauge 2-6-4T Chassis, superb workmanship, tested compressed air. Metal for tanks, cab, £100. Exchange for $10\frac{1}{4}$" gauge locomotive any condition. Wanted $7\frac{1}{4}$" gauge bogies for cash.—5, Waterloo Street, Clifton, Bristol 8.

Ajax 5" Chassis, part finished. Also complete boiler parts. Wanted, Little John lathe.—MACKINNELL, Brentwood, Lymm, Cheshire.

New Copper Boiler, centre flue, two cross tubes 6" × 13", all fittings, feed hand pump, good steamer. Stuart $1\frac{1}{2}$" × $1\frac{1}{2}$" vertical engine trunk guide height 9", drain cocks, displacement lubricator, powerful, new, £14 lot. Bargain.—MURRAY, 58, Rosebery Gardens, Harringay, London, N.4.

For Sale or Exchange coal-fired 2-2-4 single wheel Great Central, perfect order, $8\frac{3}{4}$" gauge, copper boiler, gunmetal fittings and cylinders, good hauler, £65. Wanted good traction engine, large model.—A. R. MANTLE, 19, Bishops Lane, Roberts Bridge, Sussex.

Luken's-o-Birmingham offer booklets of building instructions with drawings and photographs to construct the "Duke of Gloucester" and "Creasted Goods" tender locomotives in gauge "O", 5s. and 2s. 6d. respectively. Castings in stock. List 6d. —10, Coldbath Road, Birmingham, 14.

Exchange Heron 11' 3" sailing dinghy plans for "Juliet" plans or ?—6, Birch Close, West Weybridge, Surrey.

Pioneer 5" Gauge 0-6-0 tank locomotive for sale. A splendid model and good passenger hauler. Offers and further particulars. —SMITH, 101, Tudor Drive, Kingston, Surrey.

Models, Steam Traction and later early road transport vehicles required.—HILL, Bottings, Curdridge, Southampton.

Wanted. Small Boiler Stuart 500 or similar.—BOVEY, 61, Masbro Road, London, W.14.

ELECTRICAL

A.C. Motors Self Start, induction 200/250 volts, 50 cycles, 1-phase, 1,425 r.p.m., ¼ h.p., £4 2s. 6d., 1/3 h.p., £4 19s. 6d., ½ h.p., £6 15s. Perfect and guaranteed. Carriage extra.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

SITUATIONS

Improver. Centre lathe turner or model maker using a lathe as a hobby and wishing to earn his living in the trade.—Ordnance Buildings, Seaford, Sussex.

GENERAL

Air Compressors, tanks and accessories at far below list, from £5 17s. 6d., TV and lighting generator from £15.—TEDDINGTON ENGINEERING CO. LTD., 29-31, High Street, Teddington, Middx. Tel.: Kingston 1193.

Young & Son. Material and tool dealers, watch, clock and jewellery repairers.—133, London Road, Chippenham, Wilts.

Spraying Handbook, 3s. 10d., post free. Paints, cellulose and allied spraying sundries. Catalogue, 2½d.—LEONARD BROOKS, 25 Oak Road, Harold Wood, Romford.

Guaranteed ! Easy Home Constructed Refrigeration. Genuine domestic components. Not secondhand ice cream scrap. Modern hermetic G.E.C. units, gas, electric and oil silent unit. Everything for refrigeration. Complete specialists. Send s.a.e. for free illustrated "Sealed system" leaflet or 1s. for complete catalogue (refunded with first order).—BRAID BROS., 50, Birchwood Avenue, Hackbridge, Surrey. Phone: Wallington 9309.

Compressors for Sale. Two pistons complete with air receiver, driving wheel and motor cradle, 180 lb., 2¼ cu. ft., price £3. Motors a.c. and d.c. all types ¼ h.p., £3. Carriage forward.—WHEELHOUSE, 13, Bell Road, Hounslow. 'Phone: Hounslow 3501.

Work Wanted. Turning, capstan milling, grinding, shaping. Fully equipped works in heart of London. Single or long runs.—BELL & SMART, 48-50, Tottenham Street, W.1.

Build Your Own Refrigerator. All components available at reasonable prices. Frigidaire units, £5. Single cylinder units, £4. New G.E.C. Coldair hermetically sealed and absorption units in stock. Hire purchase available. Heavy duty motors, 1/6 h.p., £2 10s. New chrome cabinet handle and hinges, £1 set. Money back guarantee. S.A.E. for list and schematic diagram.—WHEELHOUSE, 11/13, Bell Road, Hounslow. Phone: Hounslow 3501.

Learn It As You Do It—We provide practical equipment combined with instruction in radio, television, electricity, mechanics, chemistry, photography, etc. Write for full details to—E.M.I. INSTITUTES, Dept. ME47, London, W.4.

Unowot Whiston's sell. S.A.E. catalogue.—K. R. WHISTON (DEPT. M.E.S.), New Mills, Stockport.

Wanted. Vols. 77-78 Model Engineer, 1937-8. Apply—Box No. 8611, MODEL ENGINEER Offices.

Vickers Hydraulic Unit, infinitely variable speed, reversible, brand new £12 10s., post free.—GRIFFIN, "The Mount," Crank, St. Helens, Lancs.

Bench Mill, drill, Boley lathe, tools, large steam models, beam engine, oil gear unit, belt sander, polishing head, cameras, old watch and clock movements, liner hull. Buyer collects.—15, Queens Drive, Whitley Bay.

Model Engineers, 1946-1957 unbound perfect. Vol. 94, five missing. Vol. 95-Vol. 116 complete. Must sell, complete or separate vols. Offers.—TAYLOR, 19, Hillside Willesden, N.W.10.

Watch and Clock Repairs, cleaning machines, staking tools, etc. (Large illustrated catalogue and price list, 4s. 6d.) Easy payment terms available.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1. (Best prices paid for used watches).

Chemicals and Apparatus. Send 3d. stamp for details of special offer.—SCIENTIFIC & TECHNICAL SUPPLIES LTD., Dept. M.E., 9, Wellington Circus, Nottingham.

Model Engineer 1947 to 1955 (10 missing). Mechanics 1946 to March 1955 (7 missing). Odd numbers, 1943 onwards. Amateur Mechanics published 1913 complete 24 numbers. Sale or exchange. Write —42, Newstead Avenue, Orpington.

Model Engineers fifty-four volumes 1928 to 1954 bound in blue rexine, price, £40 or near offer. Seen by appointment. Phone 1186 Fleet, Hants.—Box No. 8616, MODEL ENGINEER Offices.

CROSS SLIDE HEAD
for MYFORD M.L.7 and SUPER 7
Designed by L. H. Sparey. Described in M.E. May, 1956
£4-5-0 post free
By post only from:—
TURRET COMPONENTS
10, Hervey Park Road, London, E.17
S.A.E. for illustrated leaflet.

Wanted. Volume 24 M.E., clean, complete, and with index. Also index for volume 93.—Box No. 8614, MODEL ENGINEER Offices.

Microcord II and ½ Plate Camera with accessories, cost £110. Exchange Super 7 and extras or sell, £75.—DAVIES, 42, Wingate Road, Bentley, Walsall.

Model Engineers, 1945-1957. 670 copies, perfect. Offers—KARTRIBER, 123, Watling Avenue, Burnt Oak, Middlesex.

Model Engineers, quantity of single copies from 1910 to 1950. S.A.E.—A. E KIRBY, 267, Pascoe Vale Road, Essendon, Victoria, Australia.

Refrigerator Unit complete, less cabinet including motor, compressor valves need attention, £6 10s.—HOLMES, 107, Stockton Lane, York. Phone 24234.

For Sale. Vols. 1 to 75 bound. 76 to 114 unbound.—BEST, 39, Hylton Drive, Cheadle Hulme, Cheshire.

Ex-Air Ministry fitter's tool kits, over 20 items, £4 the set. S.A.E. details.—LEE, Fair View Farm, Oakridge Lynch, Stroud, Glos.

No Reasonable Offer Refused. Bound volumes of "Mechanical World," 1888-98; and "Engineer," 1893 (full story-drawings building Tower Bridge, etc.).—VICAR, Woodford Bridge, Essex.

Sale. Vol. 1 to 116 Model Engineer, bound. Overseas enquiries by airmail please.—Box No. 8627, MODEL ENGINEER Offices.

Volumes 86 to 110 Model Engineer, unbound, 6s. volume, carriage paid.—CLEGG, 15, Rochdale Road, Milnrow.

Model Engineer SUBSCRIPTION FORM

Overseas readers may experience difficulty in obtaining Model Engineer. To become an annual subscriber send an International Money Order for 58s. 6d. sterling ($8.50 in U.S.A. and Canada) with the completed form below.

Please send a copy of Model Engineer each week to :

Name ....
(Block letters please)

Address ....

....

enclose valued 58s. 6d. ($8.50) to cover subscription for one year (52 issues). This includes postage.

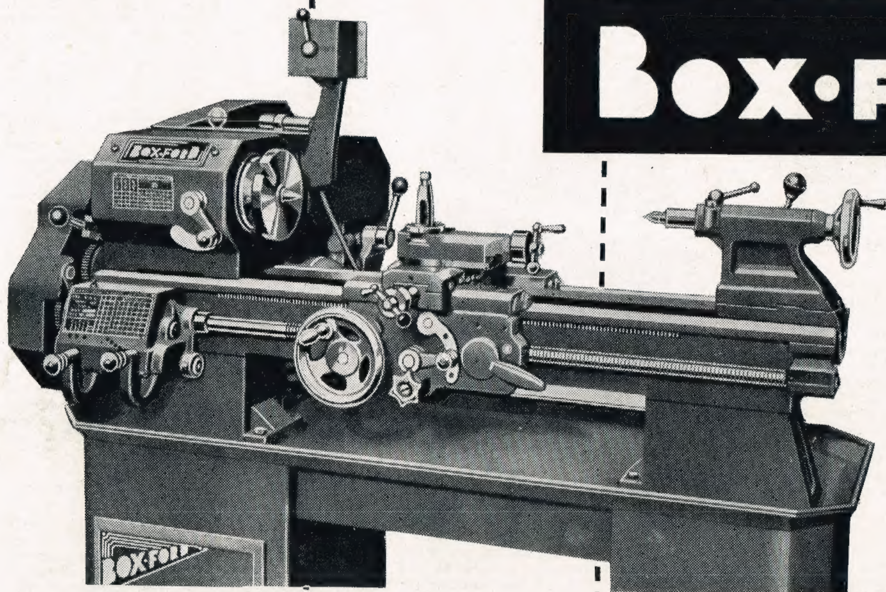
Post this form to

MODEL ENGINEER · 19-20 NOEL ST · LONDON W1

Printed in Great Britain for the Proprietors by ELECTRICAL PRESS LTD., Cordwallis Works, Maidenhead, Berks, and published by PERCIVAL MARSHALL & Co. LTD., 19-20, Noel Street, London, W.1.
Registered for transmission by Magazine Post to Canada including Newfoundland.

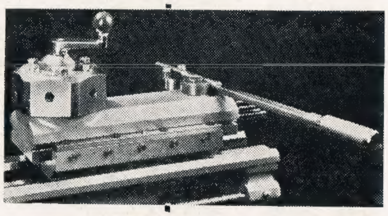
ME QUERY COUPON SEPTEMBER 1957

versatility with precision

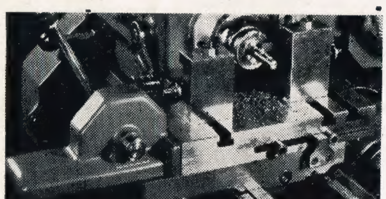


BOX·FORD

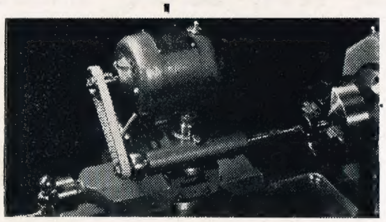
MODEL 'A'



★ Six-station Turret Head for bed mounting



★ Cut-off slide for use in conjunction with turret head



★ Tool Post Grinder

4½" SCREWCUTTING LATHE

This lathe is especially suitable for tool rooms, workshops, light manufacturing plants producing small components and for apprentice training schools. The 16 spindle speeds provide for a wide variety of needs. The accessories illustrated give increased production facilities for special jobs.

Height of centres ...	**4½"**
Between centres	**22" or 28"**
Number of speeds ...	**16**
Range of speeds ...	**40**

Send for fully detailed leaflet TODAY

22" CENTRES
PRICE
£185

DENFORDS ENGINEERING CO. LTD., HECKMONDWIKE, YORKSHIRE